

THE HARMSWORTH ENCYCLOPÆDIA.

Franc, a French silver coin dating from 1799. A piece of similar value, and bearing the same name, exists in Belgium and Switzerland; the various Latin countries have coins corresponding in value, but of different names. The *franc* is divided into 10 *décimes*, each of these being subdivided into 10 *centimes*. The *décime* is little used, but the older *sou*, worth 5 *centimes*, or about $\frac{1}{4}$ d. of English money, is still in common use. The franc is worth about 9d. in English currency, and 25·2 francs equal £1 sterling.

Francavilla - Fontana, tn., Italy, prov. Lecce, 22 m. w. by S. of Brindisi. Pop. (1901) 20,510.

France. The shores of France are washed by deep seas, with the exception of the Channel, which is of recent formation. The submarine cliffs, a fringe of the continental plateau on which rest both the British Isles and Brittany, approach the coast more and more as we proceed southwards, and we reach a depth of 1,650 ft. only a few miles out from the Pyrenees. Similarly, on the Mediterranean, except in the bight formed by the Gulf of Lions, a line of great depth runs close along the coast (1,650 ft. near the islands of Hyères). Thus there are scarcely 220 m. of land between Bordeaux and Narbonne; and this depression, which rises to no more than 625 ft. near Naurouse, is marked out by a sequence of water-courses. In the same way, by means of the Rhone, the Saône, and the Seine, one may pass from the Channel right down to the Mediterranean shore; and it is through this waterway, followed by the commerce of the ancients, that civilization has worked northwards.

The superficial area of France is now given at 207,054 sq. m. Of this total, Corsica is set down at 3,367 sq. m. The continental frontiers of France on the E. are quite arbitrary; but to the N.E. we find the Vosges and

the Jura, forming a natural defence and boundary; while on the S.E. and S.W. respectively, the Alps and the Pyrenees, both difficult to traverse, form frontiers which are, in the true sense, natural and geographical.

France has a considerable length of coast-line in proportion to its superficial area; thus of a total frontier of 3,250 m., 1,760 front the sea. The general shape of France is hexagonal, and of the six sides three are maritime—viz. the N.W. (Channel), the W. (Atlantic Ocean), and the S.E. (Mediterranean). These coasts assume a widely different physical character, according to the regions of which they form the seaboard. In some parts they are rocky, cut up into islands, peninsulas, and bays, as in Brittany and Cotentin, or with shores of high chalk cliffs, as in Caux; in other parts they are low, flat, and sandy, their littoral being bordered with dunes and marshes (i.e. the coasts of Landes and of Bas-Languedoc). Beyond the delta of the Rhone, the Alps and their offshoots extend right down to the sea, and send out a series of capes and rocky promontories, which leave between themselves and the shore nothing but a narrow 'Riviera,' a characteristic feature of the Mediterranean countries. This Riviera, sunny and smiling, presents the most complete contrast to the Breton coast, which, having defied for centuries the furious attack of the ocean, has gained the appellation of *côte sauvage*. This title is shared by certain islands which have broken away from the continent, and mark the line of the ancient coast—viz. the islands of Yeu, Ré, and Oléron.

Looking at a hypsometric map of France, and drawing an imaginary line from Mézières to Bayonne, we are struck by the contrast, as regards contour, presented by the N.W. and S.E. divisions. On the W. there extend

the French lowlands, consisting solely of bare plains or *campagnes* and small wooded clumps, of which no one is higher than 1,650 ft. The highest of these hills, often styled *bocages* (groves), are the Perche, the Bocage Normand, the Bocage Poitevin, the Menez in Brittany. To the E., on the other hand, extend the French highlands, composed either of plateaus and intermittent woodlands—as, for example, the Massif Central (central woodland), the Morvan, and the Vosges—or of mountain chains properly so called—i.e. the Alps, the Jura, and the Pyrenees. Neglecting the two basins of Paris and Aquitania, which terminate to the E. of this line, the low-lying parts are less plains, properly so called, than basins shut in on all sides, as the Limagnes of Auvergne, or natural waterways like the Rhone valley. The formation of the French soil is still more complex, for we have, in addition to the foregoing, two distinct zones of mountain folds, differing in age and origin.

(1.) During the Carboniferous epoch a first series of mountain folds (called by geologists the Hercynian chain) was formed. These can be followed from Cornwall to Central Germany. In France its direction was in the first instance from N.W. to S.E., this direction being preserved by the heights of Brittany and of Vendée. Towards the centre of France an upheaval of the folds took place in the form of a V, and the orientation was changed to S.W. and N.E. At the convergence of these two lines of direction there was a line of feeble resistance, along which, by a series of cracks, the volcanic discharges took place which give to Auvergne such a unique physical character (Monts Dômes, Monts Dore, Cantal, Aubrac, and Velay); while in the folds of the chain were formed lagoon and estuarine deposits,

which now constitute a continuous series of coal basins. This ancient chain is now broken up and divided into fragments separated by substructural depressions (that of Poitou, the Morvano-Vosgian depression, or that of the Côte d'Or).

(2.) On the circumference of this primary France chains belonging to the great zone of Tertiary mountain folds have arisen at a more recent date. On the one hand, the ancient *massifs*—Massif Central, Beaujolais, and Charolais—were dislocated and broken up, and while certain divisions (Limagnes) subsided, all the E. fringe was raised to a great height (Cevennes). Then volcanic eruptions made a way out of the reopened fissures, and these new bosses, superadded to the primitive plinth, reached a height of 6,095 ft. in the Cantal.

towards its upper end, or in the plain of the Saône, and along the Mediterranean in Bas-Languedoc.

The hydrographic basins are likewise a result of the geological structure, and they in general correspond to the basins above mentioned.

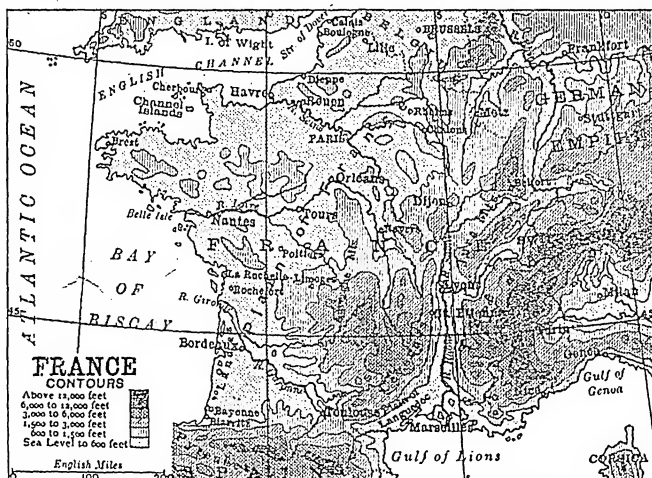
(1.) The Seine (485 m.) corresponds to the basin of Paris, the structure of which accounts for the converging direction of the principal tributaries—the Yonne, Marne, and Oise—towards the centre of the basin. Its singularly calm and regular course is explained by the moderate rainfall, by the permeability of the soil, and by the gentle slope.

(2.) The course of the Loire (634 m.) has been determined by means of heterogeneous elements. Formerly a tributary of the Parisian basin, through the present valley of Loing, it was attracted to-

(4.) The Rhone (504 m.) is formed by the union of Alpine rivers (the Rhone of Valais and the Arve), which have summer augmentations, caused by the melting of glaciers, and of a quiet river of the plain—viz. the Saône, which has autumn and winter augmentations, acting as a balance to those of the Alpine rivers. But the torrents in the Cevennes flow down steep slopes, and thus destroy this equilibrium. They have only too frequently been the cause of floods. The Alpine tributaries, Arve, Isère, Durance, are enlarged in springtime, when the snows melt; and their size is maintained throughout the summer by the glaciers. The problem of the economic utilization (navigation, lateral canals, irrigation, and motive-power) is at the present moment under discussion. The Rhone has by far the greatest volume of French rivers, discharging as much water as all the rest put together.

Climate.—In almost its whole extent France is subject to oceanic influences, and has thus a climate of damp warmth. Westerly winds predominate, and give to Brittany 160 to 180 rainy days annually, and 150 even to Paris. These rains are, however, so fine and impalpable that, though they are accompanied by perpetual mists, they give only an annual rainfall of 23.6 inches at Paris. A comparison of isothermal and isochimical lines demonstrates that the ocean acts more strongly in raising the temperature of winter than in lowering that of summer. At Brest the average temperatures of January and July are 44° 6' and 64° 4' respectively; at Paris, 35° 6' and 66° 2'—the difference being due to the greater distance from the ocean. The 'mistral' blows with much constancy and force from the central plateau upon the Mediterranean coast. Though often violent and always chilling, its effect is in the main beneficial. The rainfall is greatest on the coast and in the mountain regions, and least on the N. plains.

Although France, taken all in all, presents a certain uniformity of climate, yet a certain number of climatic regions may be distinguished which differ in their extremes of temperature, in their variation between these extremes, and also in their annual rainfall. These are exemplified in the climate of (1) Brittany, (2) the Vosges, (3) Paris, (4) the Gironde, (5) Auvergne, (6) Mediterranean coast, (7) the Rhone valley. Two of these climates exhibit special features of difference—viz. that of Brittany, with its lowering sky, continuous clouds, prevailing and persistent mists, and absence of summer; and that of Provence,

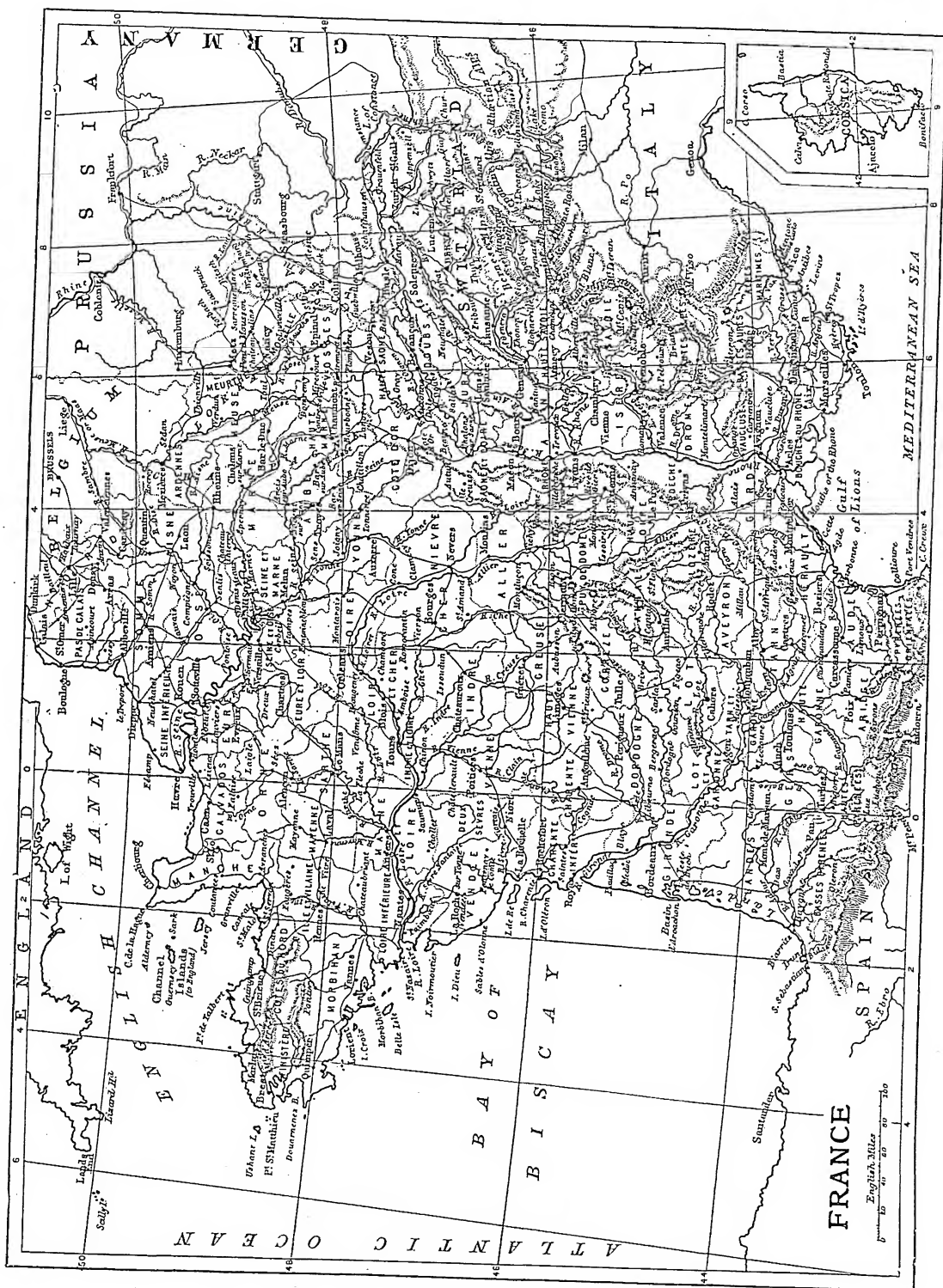


But, on the other hand, the more recent strata, in working forward, pressed against the ancient *massifs*, and were thus forced to follow their contours. Hence the Alpine arc, as well as its branch the Jura, was inflected to the north-east.

Finally, in the spaces between the chains and the *massifs*, or in the gulfs which form indentures in them, deposits of marine or lacustrine origin were laid down, forming those basins which are the final physical feature of the actual soil. The Parisian basin, formed of concentric bands, the levelling of which causes a cliff at the outer extremity, presents a perfect type of these basins. This formation of graded shelves does not exist in the basin of Aquitania, which is likewise filled with Tertiary deposits. As for the Rhone valley, it is a water-course which only widens out

wards the ocean by an opening in the Armorican *massif*. Its irregular flow, its terrible floods, and the sandbanks which obstruct it, make it quite unfit for navigation, and render useless its magnificent network of tributaries, the Allier, Cher, Indre, Vienne, and the Maine with its ramifications.

(3.) The Garonne (404 m.) corresponds to the basin of Aquitania. It is also, owing to the clearing of the Pyrenean forests, subject to disastrous floods; while the sediment which it carries away obstructs the passages of the mouth. Its chief tributaries, the Lot, the Tarn, and the Dordogne, take their rise in the Massif Central, and are of little use for purposes of navigation; but the Garonne is navigable as far as Toulouse, whence the Canal du Midi communicates with the Mediterranean.



which enjoys the climate of the Mediterranean, with its bright sky, its cloudless light, its dry and clear atmosphere, and its absence of real winter.

Agriculture.—In France agriculture has made great strides during the last hundred years. Waste lands, moorlands, commons, and heaths take up only 12 per cent. of the agricultural soil. The two chief products, which have set their mark on the character of the French peasant, are wheat and the vine. The cultivation of wheat has developed both as regards the superficial area of the land occupied and the yield per acre, which, from 11 bushels at the beginning of the 19th century, has reached an average of 18.7 (27.5 in the north and in the Pas de Calais). The most intensive agriculture is carried on in the basins of the Seine, the Garonne, the Upper Saône, and the Middle Allier. In the basin of Paris and the N.E. generally, industrial plants are cultivated, particularly the sugar beet.

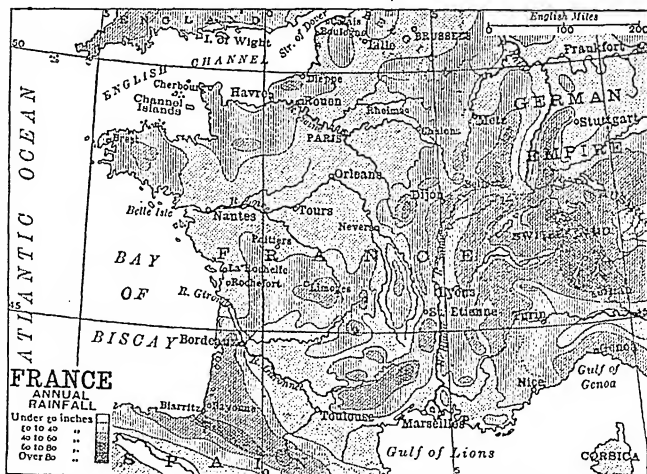
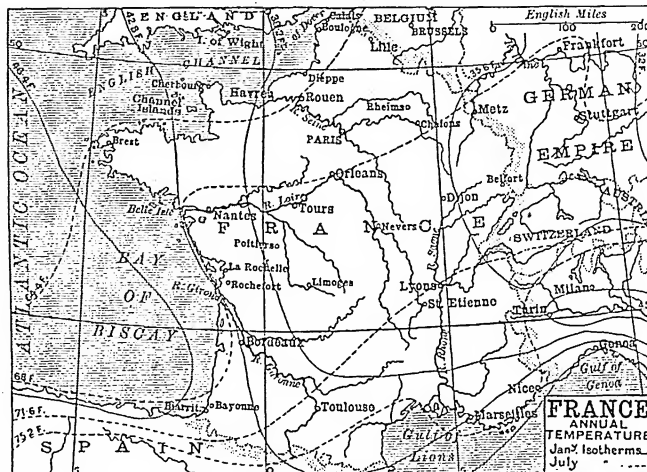
The vine, which is replaced in Normandy and Brittany by the apple (for cider), and in the N.E. by hops (for beer), was hard hit for some years by the ravages of phylloxera. But the French vine-grower has struggled with admirable perseverance against this scourge, and wine-growing is now in its old position. The yield of the last few years ranks with that of the most prosperous years. Average of 1900-4, 1,200 million gallons; total of 1905 (10 months only), 1,247 million gallons. The vine flourishes in three regions—(1) in the w., round the plateau of Langres; (2) in the E., south of the Loire, and round the Gironde; and (3) south of the Cevennes. In the E. the best wine-producing regions are Champagne in the N., the Côte d'Or in the centre, and Bourgogne (Burgundy) and Mâconnais in the S. The vineyards of Charente, the Bordelais, and Armagnac are the most important in the w. Although vines are grown in the Rhone valley and in Provence, the most fruitful vineyards of France are those of Languedoc, w. of the Rhone, especially in the department of Hérault.

Forests (olive, mulberry, chestnut, and cork oak) occupy 35,000 sq. m.; vines were cultivated on 4,173,140 acres in 1905, and on 5,424,120 in 1882, the year after the phylloxera began its ravages.

Ethnography.—In remote times the south of France was occupied by Iberians and Ligurians from N. Africa, and all the land north of the Garonne by Celts from Central Europe. These were followed in the historic period by Phœnicians from

N. Africa; Greeks from Asia Minor; Romans, the great civilizers, from Italy; Teutons (Visigoths, Burgundians, and Franks) from Germany; and Norsemen from Scandinavia, all in the order named. Apart from a few Basques and Flemings in the extreme south and north, the Celts alone survive as a distinct race in Brittany, where they were reinforced in the 5th century A.D.

annually (28 millions in 1895), whereas the consumption is more than 40 millions, the surplus being imported from England, Belgium, and the Rhine coal fields. The chief coal basins are those of the north and of the Pas de Calais, of the centre (Montceau-Mines, St. Eloy, St. Etienne, Decazoville), and of the west. The iron ores of Lorraine, of Comté, and of Berry complete the



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mineral resources. The metallurgical industries include the production of iron ore, pig iron, finished iron, and wrought steel, to the value of thirty millions sterling per annum, and zinc, lead, copper, nickel, etc., to the value of two millions. The main textile industries are cotton-spinning, linen and hemp, woollens, and silk manufacture, the last principally at Lyons, where the value of the production for 1904

was eleven millions sterling. The production of sugar in 1904-5 amounted to 562,740 tons. The industrial centres may be most conveniently grouped around the coal basins, on account of the low price of fuel, or around the seaports where English coal is landed. The chief groups are those of the north, of Lyons, of Paris, and of Nancy. Industry is now spreading more and more in the high Alpine valleys—thanks to the utilization of natural motive-power.

Trade.—The maritime commerce of France is not in a prosperous state, and it is at the present day surpassed by even such countries as Norway. This, among other causes, is due to the over-multiplication of ports, which prevents the authorities from concentrating the sums set aside for their improvement on a few only, and also to the poor

£23,232,700, of which 69 millions sterling are with Great Britain. Its development dates from 1860 (commercial treaties), but since 1892 it has been practically stationary. The mercantile navy in 1903 consisted of 14,910 sailing vessels (650,209 tons) and 1,383 steamers (585,132 tons).

Communications.—As a consequence of its general situation, and of the peculiar arrangement of its valleys, France has always been well equipped with highways of traffic. The great network of Roman roads was completed by Colbert and Napoleon, and is unequalled in the world. France possesses altogether some 27,250 miles of railway. All the great lines start from Paris, and run towards the large towns. As regards speed, the French lines are among the first in the world.

The waterways have been a little neglected in favour of the

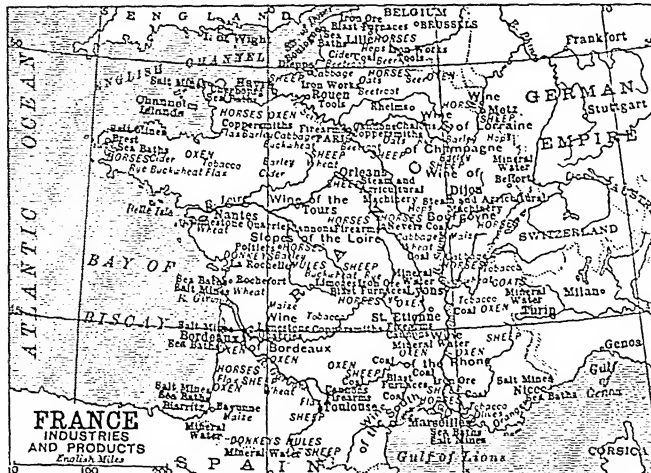
of three. The executive power belongs to the president, elected for seven years by the National Assembly. It is he who chooses the ministers according to the indications of the Parliament. The ministers form a cabinet, jointly and severally responsible, presided over by a president of council.

Army and Navy.—The army, divided into the regular and the territorial, each having its own reserve, numbers on a peace footing 580,420 men (1905); on a war footing, from 4 to 5 millions of trained soldiers, of whom about 2½ millions would be available. Three years' service in the active army is compulsory on all males, except those passing certain examinations, or the sons of widows, of whom only one year's service is demanded. The country is strongly fortified, particularly along its E. frontier.

The navy (53,800 men) is recruited from among the sailors and fishermen of the coasts. The coasts are divided into five maritime prefectures, each having its headquarters in a fortified port—Cherbourg, Brest, L'Orient, Rochefort, Toulon.

Religion.—The Roman Catholic faith was officially recognized as the 'religion of the majority of the French nation' down to Dec. 9, 1905, when church and state were separated. Its relation with the state was regulated by 'the Concordat.' There is now no state religion, and freedom of worship is accorded to all creeds. France is divided into seventeen archbishoprics—Aix, Albi, Auch, Avignon, Besançon, Bordeaux, Bourges, Cambrai, Chambéry, Lyons, Paris, Rheims, Rennes, Rouen, Sens, Toulouse, Tours. There are sixty-seven episcopal dioceses, three additional sees in Algeria; and in general they correspond to the departments. There are in France 600,000 Protestants (the Reformed or Calvinistic Church, and the Lutheran), and 70,000 Jews, mostly in Paris, Bordeaux, and the east.

Education.—Public instruction falls into three grades: primary (in each commune there is at least one school); secondary (lycées and colleges); and higher (faculties of university rank and five free Roman Catholic universities). Along with this state education there exists a voluntary system uncontrolled by it. France has the following educational districts: Lille, Paris, Caen, Rennes, Nancy, Besançon, Dijon, Chambéry, Lyons, Clermont, Poitiers, Toulouse, Montpellier, Grenoble, Aix. In addition, there are the following large scientific institutions: Collège de France, Museum of Natural History, Ecole Normale Supérieure, Ecole Pra-



return from harbour dues. Two-thirds of the maritime commerce is carried on by vessels under foreign flags. The great port of Marseilles (7 million tons yearly, or a fifth part of the total tonnage of the country) finds it difficult to compete with the neighbouring port of Genoa, which is better equipped. The other ports—Le Havre, Bordeaux, Nantes, Dunkerque, Saint Nazaire, and Cette—are insufficiently endowed. These places are the ports of call for the subsidized maritime companies—the Transatlantic, the Messageries Maritimes, the Chargeurs Réunis (United Cargo Company), etc.

The gross commerce of France reaches an annual value of 458 millions sterling (imports 228, exports 230). The imports for home consumption were valued at £187,000,000 in 1905, and the exports of French goods at

railways. The busiest canals are those of the north, and those which join the north to Paris and the lower Seine, which is itself a highway of active navigation. The port of Paris has a tonnage equal in importance to that of Marseilles. In 1905 there were: navigable rivers, 5,500 miles; canals, 3,000 miles.

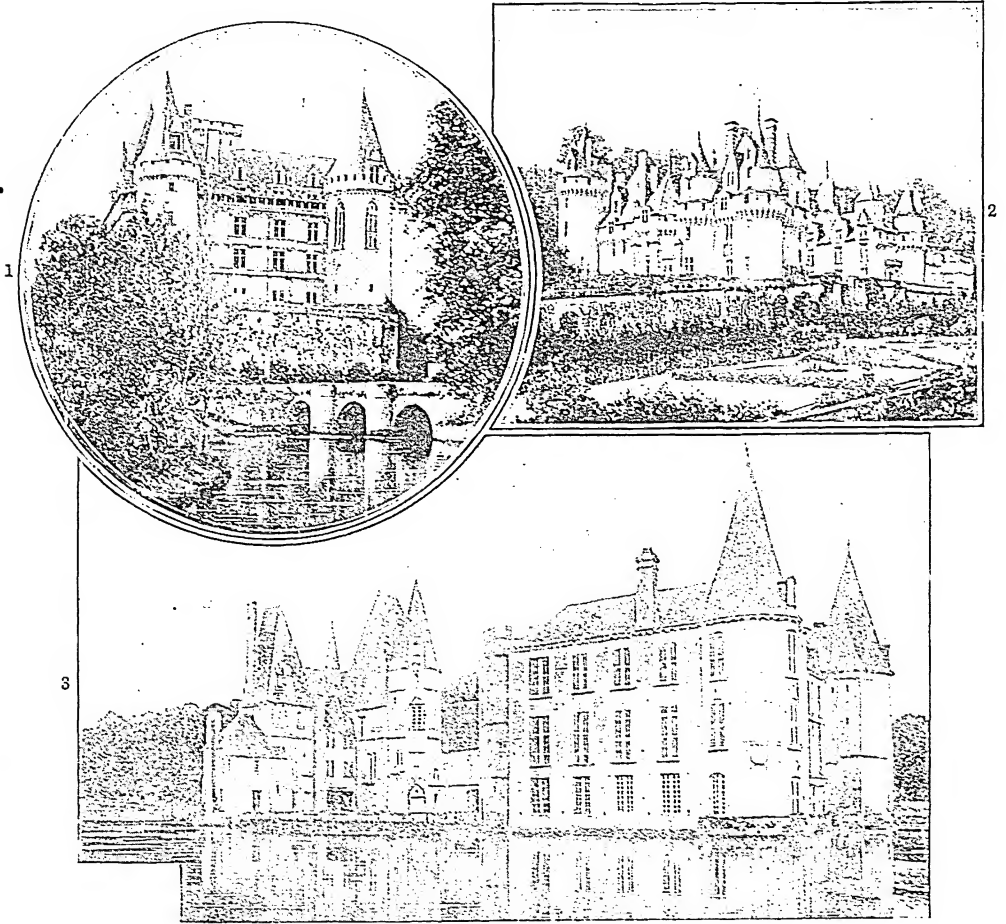
Government, Constitution, etc.—France, which is at the present day a centralized republic under one head, was formed by a long tradition of monarchy. The constitution of 1875 is based on universal suffrage. The legislative power, and indeed the control of the executive also, belongs to a Parliament composed of two chambers—the Chamber of Deputies, elected for four years by a direct suffrage; the Senate, the outcome of a double election, elected for nine years, and eligible for re-election for periods

tique des Hautes Etudes, Ecole des Chartes, Institut de France formed from the five academies, and others.

• *Population*.—Over a superficial area of 207,054 sq. m. France possesses (1901) 38,961,945 inhabitants—i.e. 188'1 per sq. m., a much lower proportion than that of Belgium and of the United Kingdom, and higher

deaux, 257,638; Nantes, 132,990; Le Havre, 130,196; Nice, 105,109; Lille, 210,696; Paris, 2,714,068; Lyons, 459,099; Rheims, 108,385; Marseilles, 491,161; Roubaix, 142,365; Nancy, 102,559; Rouen, 116,316; St. Etienne, 146,559; Toulon, 101,602; Toulouse, 149,841. See Reclus's *La France* (2nd ed. 1885); Ardouin-Dumazet's *Voyage en France* (1893,

peopled by Greeks; and the natives of the interior learned from the new-comers something of the commerce and arts of the more civilized countries of the Mediterranean. The inhabitants, too, of what we should call France were closely akin to those of the Po valley, and from 218 B.C., when Hannibal crossed Southern Gaul, the relations of



France: Famous Châteaux.

1. Larochefoucault. 2. Château d'Ussé. 3. Château d'O.

only than that of Austria-Hungary, of Spain, and of Russia. The increase since 1896 numbers 44,000 inhabitants—i.e. 1'15 per cent. The departments which are growing are Maritimes-Alpes, Seine, Bouches du Rhône, and Brittany; but the majority are decreasing, especially in the Garonne basin and in Normandy. Large towns of more than 100,000 inhabitants in 1901; Bor-

etc., 26 series already appeared); Joanne's *Dictionnaire Géographique et Administratif de la France* (new ed. 1888, etc.); Levasseur's *La France et ses Colonies* (3 vols. 1890-3); Paul Girardin's articles on France in the *Annales de Géographie*.

History.—As early as the 6th century B.C. the colony of Massilia (Marseilles) was founded by Phœnicians, and subsequently

the Gauls with Rome were frequent. Eventually Southern Gaul became a Roman province. Hardly had this settlement been achieved than the Gauls and Romans alike were threatened by the Cimbrians and Teutons; but in 102 B.C. Marius entirely defeated the invaders at Aix (Aque Sextiae).

In 58 B.C. Cæsar was appointed to the command of the southern

province, and was soon drawn by circumstances and his own ambition to interfere in the interior. For again Gaul was threatened by invaders—this time the Helvetians; and on the upper Rhine the Germans, under Ariovistus, were also menacing the security of the country. Cæsar forced the Helvetians to retire, and at Vesontio (Besançon) he inflicted an annihilating defeat on the dreaded Germans. Then in a series of campaigns, which are among the most brilliant in history, and are described by himself with extraordinary lucidity and power, he procured the nominal submission of the whole country. But his absence in Britain allowed the organization of rebellion. The first outburst was crushed, but then in 53 B.C. central and southern Gaul rose under the able and heroic chieftain Vercingetorix of the Arverni. Cæsar never met a more dangerous antagonist; but in 52 B.C. Vercingetorix was captured in Alesia, and after that the revolt was over.

In the year 180 (which may be taken as marking the end of the tranquil period of the Roman empire) no province stood higher in culture, prosperity, and order than Gaul. But the following centuries were for Gaul, as for the rest of the empire, a time of violent confusion and rapid transition: the two chief forces on which the future of the country depended were the Christian church and the barbarian invasions. Visigoths and Ostrogoths, Vandals, Burgundians and Lombards, Alemanni, and others passed through the land, and effected settlement, usually of a transitory kind. Constantine and Julian are both closely identified with the province.

In 450, the appearance of Attila at the head of a vast army, chiefly consisting of Huns—compared with whom all other barbarians were civilized—startled all the inhabitants of Gaul into temporary union. The Roman Ætius met the 'scourge of God' at Châlons-sur-Marne with an army of various elements, and, after a desperate contest, practically annihilated the barbarians. In 476 the western empire of Rome ended, and Gaul had to work out her own destiny. That destiny was to be largely influenced by the Franks, a people of Germanic stock. Early in the 5th century these people were already settled along the central and lower course of the Rhine (the Salians at the mouth of the Rhine, the Ripuarians between the Meuse and the Moselle). Chlodwig (Clovis, Louis) became king of the Salian Franks in 481, and he defeated in turn

the Romans (486 A.D.), the Ripuarian Franks, and the Alemanni. But the really decisive event for himself, his dynasty, and his race was not military, but religious. In 496 he accepted Christian baptism at Rheims, at the hands of St. Remigius. Most of the other barbarian races were Arians, and the persistent hostility of the Catholic Church contributed very largely to their overthrow and disappearance. But Chlodwig had the good fortune to join himself to the orthodox church. The union between the French royal house and the papacy was all through the middle ages of the closest description, and it is difficult to say which side gained most from the union.

But the dynasty of Chlodwig (the Merwings or the Merovingians) had no organization that could guarantee its stability. Soon we find Gaul, amidst much confusion, divided into three main parts. In the south was the Burgundian kingdom; in the north, Austrasia and Neustria. Neustria was the western and more southerly portion, occupying, roughly speaking, the country between the Loire and the Meuse, very largely influenced by Roman culture. Austrasia stretched from the Meuse to the Rhine and beyond; it was thoroughly Germanized, and hostile to the civilization of the west and south. The last half of the 6th and the first part of the 7th century are for the Frankish kingdoms a period of violent confusion. The rivalry of Neustria and Austrasia is reflected in the fierce contest of Brunhilda and Fredegond. Meanwhile power was slipping from the Merovingian kings. They were, for the most part, weak in body and mind, and their servants and ministers made themselves first independent, then supreme over them; finally, they deposed the Merovingian kings, and reigned in their stead. These were the mayors of the palace—at first mere court officials, who subsequently held a power something like that of the justiciars in Angevin England. Regularly, for many reigns, the kings reigned and the mayors ruled, until at length the phantom monarchy seemed no longer worth preserving, and the mayors of the palace themselves founded a dynasty, the Carolingian, that eclipsed the Merovingian.

Pepin, Grimoald, Ebroin are among the most important mayors of the palace. But the great founder of the Carolingian line was Pepin of Héristal (687-714). He was an Austrasian, but in the battle of Testry (687) he beat down the rival power of Neustria,

and thus established the supremacy of the eastern and less Latinized Franks. He, too, was the first to make real progress in the introduction of Christianity among the Germans across the Rhine. He was succeeded in his mayoral power by Charles Martel (717-741). He was (after the battle of Vincy, 717) mayor of the whole of the Frankish territory, and he brought it to a much higher grade of order, discipline, and unity than it had yet attained to. But the Frankish power and all Christendom was threatened by the startling advance of the Mohammedan power from Spain. In 732 Charles met them, and in the epoch-making battle of Poitiers or Tours dealt them a blow from which their power in the west never really recovered. But this, though the greatest of Charles's exploits, is by no means his only one. He extended the frontier of the Frankish power in the north and east by the conquest of Frisia, Saxony, and Swabia. He co-operated with the papacy and the English monk St. Boniface in spreading and guarding Christianity in Germany. But Charles Martel, strong as he was, did not dare, or did not care, to sweep away the phantom kings—the *rois fainçants*. His successor, Pepin (741-768), did, however, take this inevitable step. In 751 the Pope readily gave Pepin permission himself to claim the royal title. King Pepin fully repaid the debt when he entered Italy, broke the Lombard power which was threatening to destroy the independence of the papacy, and granted to the Pope territories which formed the beginning of the states of the church (755).

In 768 his son Charles succeeded him (768-814). Charles the Great or Charlemagne brought Germany finally into the circle of European civilization. He introduced a far better organization of government than anything the world had known since the fall of the Roman empire, and this is the basis on which most continental states have been built; in fact, he founded the mediæval empire; he fanned the languishing embers of culture and education into a blaze that did not entirely die down at his death. 'With him,' writes a French historian, 'the dissolution of the ancient world ends; with him the construction of the modern world begins.' The following is a summary of his chief acts. On the appeal of the Pope he conquered Lombardy, and took the title of 'Charles, king of the Franks and Lombards, and patrician of the Romans.' In a long series of campaigns he broke the Saxon power and incorporated it with

his dominions. He conquered, in person, or through his generals, Bavaria, the northern Slavs upon the Baltic, the Avars of Hungary, and the Mohammedan dynasty of Spain. On Christmas day 800 he was crowned, in St. Peter's at Rome, by Leo III., and hereafter styles himself 'Emperor of the Holy Roman Empire.' This, the best-known incident of his life, was a step of the most doubtful value; the connection between the empire and Italy proved a danger to both. But it had little influence upon the future history of France.

Although the influence of the great Charles's work was permanent, yet signs of disruption were plentiful during the reign of his successor, Louis the Pious; but on his death, in 840, the tendency became irrepressible. In 843 the treaty of Verdun partitioned the empire of Charles among three claimants. Another Charles was to have the west, which is henceforward properly known as France. Louis took the east, which subsequently grew to be Germany. Between them was erected the middle kingdom of Lotharingia (Lorraine).

The century and a half from 843 to 987 is a period of great obscurity and confusion. The Danes attacked at various points, penetrating up the Loire, the Seine, the Garonne, the Scheldt. The Carolingian dynasty showed itself nearly as feeble as the old Merovingian, and there were no mayors of the palace to take it into tutelage. Paris was attacked by the Northmen in 885, and though they were driven off from that city, they made themselves masters of many other places, such as Rouen, Bordeaux, and Aix-la-Chapelle. In 912 the treaty of St. Claire-sur-Epte ceded to them Normandy, where their successors were destined to play so great a part. As the power of the monarchy decayed, the feudal powers of the great nobles developed, and the authority of the monarchy became merely nominal. In 987 the most important of these noble families forced itself on to the throne, in the person of Hugh Capet. With him the third French dynasty begins. But for more than a century its fortunes were very obscure; the reigns of Hugh Capet (987-996), Robert II. (996-1031), Henry I. (1031-60), Philip I. (1060-1108) call for no remark here.

With Louis VI. (1108-37) a decided upward movement is perceptible. Despite his unwieldy bulk, he set himself to the task of government with great energy. He enforced good order within his duchy of France, and he united (temporarily) the

duchy of Aquitaine to the territories of the crown. But the less striking features of his reign are really the more important: he strengthened the union of the Capetian dynasty with the papacy, and in the throes of its struggle with the empire, and put the monarchy forward as the champion of the weak against the strong—that is to say, of the town folk, peasantry, and clerks against the feudal nobles. The long reign of Louis VII. (1137-80) is comparatively inglorious. He was well served by the Abbot Suger, but his energy was chiefly thrown into the crusades; and he inflicted a really serious blow on the prospects of the French monarchy when he divorced his wife, Eleanor of Aquitaine, and allowed her and her dominions to pass into the hands of Henry II. of England.

But France was saved from the peril by Philip Augustus (1180-1223), who was one of the chief founders of the French monarchy. In 1199 the Angevin power came into the weaker hands of King John; and Philip Augustus, by subtle diplomacy and bold fighting (the battle of Bouvines, 1214), expelled the English king from Brittany, Normandy, Maine, Anjou, Touraine, and most of Poitou. This was the principal event of his reign; but, at the same time, the internal organization of France was rendered more effective by the emancipation of the towns from the feudal yoke, by the better organization of a central administration of law, and by the rapid growth of the University of Paris. Paris became decidedly the most important city in Europe. The policy of Philip was prolonged into the short reign of his successor, Louis VIII. (1223-6), and then came Louis IX. (St. Louis; 1226-70). This reign is the real culmination of the mediæval monarchy of France. Louis was only nine years of age on his accession, and during the first years of his reign France was under the guidance of his mother, Blanche of Castile. Few young women have shown greater powers of statesmanship than she. She beat down the recalcitrant nobility; and in 1229, by the treaty of Meaux, most of the rich country of Languedoc, which had been desolated by the never-ending Albigensian wars, was annexed to the crown of France. Louis himself furnishes one of the instances, rare in history, where the highest qualities of the soldier and statesman are linked with a sensitive conscience, deep piety, and unsullied honour. 'Human virtue,' said Voltaire, 'can attain to no greater height than the character of St. Louis.'

He kept a firm hand on the turbulent power of feudalism, and even when the nobles were joined by Henry III. of England, he beat them without difficulty; and his conciliatory and just settlement after the war was even more remarkable than his success as a soldier. His internal reforms were very numerous. The most important was the development of the Parliament of Paris a great legal corporation, henceforward the chief agent of the crown in combating the nobles. He also prohibited judicial combat, and the right of private war; he systematized the organization of France, both central and provincial. The University of Paris rapidly developed during his reign, and the Sorbonne (the theological faculty of the university) was founded by him; and such great scholars as Roger Bacon and Thomas Aquinas were attracted to Paris and taught there. His relations with the church were naturally cordial throughout; but St. Louis was never weakly compliant to every suggestion that came from Rome. Twice he was induced to embark on the crusading movement. His great crusade took the form of an attack on Egypt, which was at first successful, but then in 1250, at the battle of Mansorah, ended in a huge disaster. In 1270 he led an attack against Tunis, and there died of pestilence.

Philip III. ('le Hardi') succeeded (1270-83). The chief event of his reign was the destruction of the French power in Sicily (the sovereignty of which had been given to Charles of Anjou, brother of St. Louis), by the massacre known as the Sicilian Vespers. But when Philip IV. ('le Bel') mounted the throne in 1285, one of the most important reigns in European history commenced. He was the grandson of St. Louis, but there is nothing in Philip that reminds us of the pious king. A ferocious energy and egotism that grew with success are the most obvious features of his character. A close parallel might be drawn between Philip IV. and the English Henry VIII., both as to motives and policy. The chief incident of his early reign was the war with Flanders. In 1300 this rich district was annexed to the French crown; but the exactions of Philip IV.'s lawyers—such men as Pierre Flotte and Guillaume de Nogaret—forced Flanders to rebellion in 1302; and then at Courtrai, the Flemings gained an overwhelming victory over the knights of France. The defeat was to some extent avenged at Mons-en-Puelle (1304), but Philip had to accept a treaty whereby all Flan-

ders beyond the Scheldt was abandoned.

Before this war was over Philip's quarrel with the papacy had begun. In 1299, the Pope, by his bull *Clericis Laicos*, had forbidden the laity to exact money from the clergy, but he had yielded to the strong protests of the king of France. After the jubilee of 1300 had given Boniface VIII. a still higher opinion of his powers, the quarrel broke out more fiercely over the question of the comparative powers of pope and king in the management of the church. Bulls and royal edicts answered each other until, in 1303, Boniface excommunicated Philip and accused him of the most deadly heresy. In the same year, Nogaret and Jacopo Colonna, as agents of the king, seized the Pope at Anagni, and by violence tried to force him to abdicate. He steadily refused, but died in the same year. Philip then procured the election of Clement V., who was so subservient to the king of France that he not only withdrew his bull of excommunication, but consented to take up his residence at Avignon (1309), which, though papal territory, was really in the power of France. The greatest mark of this victory of royalty over the papacy was Philip's destruction of the order of the Templars (1310). During his struggle with the papacy Philip had relied on the support not only of the Parliament of Paris (which was not a representative body at all), but also of the States-general, now summoned for the first time to represent the three orders or estates of the realm (1302).

Philip's reign seemed to mark the zenith of the royal power, but it was the prelude to a very rapid decline. Philip's three sons, Louis X., Philip V., and Charles IV., reigned in quick succession, and all died without male issue. A disputed succession was the result, for it was maintained that by the Salic Law women in France could not succeed nor transmit sovereignty. Edward III. of England claimed the throne as son of Isabella, daughter of Philip IV., and thus the Hundred Years' war (1337-1453) began. The English won the battles of Sluys in 1340, Crécy in 1346, Poitiers in 1356, and Najara in 1367, for the feudal levies of France could make little headway against the compact armies of English archers and footmen. Philip VI., with whom begins the Valois dynasty, reigned as the national king from 1328 to 1350, and was succeeded by John II. from 1350 to 1364; but the disasters of the war stirred up a violent revolutionary movement that seemed for a time to destroy the power of the monarchy. The States-general

of 1357, under the guidance of Etienne Marcel, claimed the most extensive powers; but the movement was premature, and disappeared finally amidst the utmost violence and tumult. The condition of the country at large, and especially of the peasantry, was deplorable.

Charles V., who reigned from 1364 to 1380, employed companies of mercenary soldiers instead of the old feudal levies, and refused all pitched battles. He was fortunate, too, in finding a commander of genius in Du Guesclin, and by the end of his reign he had worn down the English, reduced their power to very narrow limits, and even retaliated on the coasts of England. Charles VI. (1380-1422) was only twelve years old on the death of his father. In 1392 he became mad, and the exercise of power was disputed between the Orleanists (or Armagnacs) and the Burgundians, with the utmost bitterness and ferocity. It was under such circumstances that Henry V. of England won the battle of Agincourt in 1415; and in 1420, by the treaty of Troyes, it was agreed that he should marry Catherine, the daughter of Charles VI., and inherit the throne of France after the death of her father. The national cause was still maintained south of the Loire by Charles VII.; but it was torn with dissensions, and the outlook seemed hopeless. Then the year 1422 cleared away the two great enemies of France—namely, Henry V. and her own imbecile king.

Charles VII. (1422-61), in whose reign the salvation of France was accomplished, contributed little to it, and is unworthy to have his name associated with it. The quarrel between Burgundy and the monarchy was patched up; the English government was weak and vacillating. Then came that miracle of history, Joan of Arc. The siege of Orleans was relieved in 1429; the illustrious maid was put to death in 1431, and the clouds were still thick round France. But in 1450 the English were driven out of their last stronghold in Normandy; in 1453 the last blow in the war was struck in Castillon, near Bordeaux, and France was mistress within her own boundaries again. In spite of all cross-currents, her destiny ran irresistibly towards a strong monarchy. In 1439 the States-general granted to the monarchy a tax (*Un taille des gens d'armes*) in perpetuity for the maintenance of a standing force: all unwittingly they threw from their hands those very weapons whereby the English Parliament was to win its supremacy. France had suffered terribly during the English wars. It needed a strong

will and a not too scrupulous arm to restore order and health to the commonwealth, and in Louis XI. (1461-83) France had both. He crushed the great nobles, strengthened the Parliament of Paris and established provincial parliaments, encouraged industry, welcomed the invention of printing, and did much for art and letters in France. He was hated by the nobles, but was not unpopular with the middle classes and the peasants. But the chief incident of his reign was his long struggle with Charles the Bold, Duke of Burgundy, whose great possessions and claims in Flanders, Brabant, Luxemburg, Lorraine, and in the county and duchy of Burgundy, made him a most dangerous rival to France: he nearly succeeded in re-establishing something like the old kingdom of Lotharingia as it had been defined by the treaty of Verdun. It was the conflict of feudal chivalry in its decadence and modern statesmanship in its embryonic form. A false step on the part of King Louis made him the duke's prisoner at Péronne (1467), but the duke's mistakes and the king's astute and unscrupulous diplomacy gave Louis the victory in the end. The Burgundian power was broken in its attack on the Swiss confederacy, and Charles the Bold was himself killed at Nancy in 1477. Artois and the duchy of Burgundy were permanently annexed to France.

Louis XI. was succeeded by his son, Charles VIII. (1483-98), whose nature, very different from that of his father, was attracted by adventurous and grandiose plans. One solid advantage accrued to France from his reign: by his marriage with Anne of Brittany (1491) that province was annexed to the French crown. But the chief fact of his reign is that he put forward a specious claim to the kingdom of Naples, and in 1494 crossed the Alps to enforce it. This date is often taken as the beginning of modern history; for the French attack on Italy upset the European state-system and brought into existence the idea of 'balance of power,' while it synchronized, or nearly so, with the discovery of the New World, the culmination of the renaissance, and a very marked decline in the authority of the papacy. Charles VIII.'s expedition into Italy was at first brilliantly successful. Naples was reached and occupied; but then the subtle Italians combined against the French king; his conquests were lost, and he escaped with difficulty from Italy.

In 1498 Louis XII. succeeded to the throne. His reign was a

successful and prosperous one at home; but his Italian wars were even more dangerous than those of Charles VIII. He claimed not only Naples but Milan. Milan was occupied in 1500; then Louis XII. made an arrangement with Spain for the partition of Naples (the treaty of Granada). The unfortunate kingdom could not resist the combined attack; but hardly was the conquest made than the victors began quarrelling, and in the war that followed the Spaniards expelled the French (battles of Cerignola and Garigliano, 1503). But Louis XII. was not induced by this mishap to abandon Italian adventure. In 1508 he was a prominent member of the League of Cambrai—an alliance between France, Spain, the papacy, and other powers, for the spoliation of Venice. This expedition followed the usual course of French expeditions into Italy. First there was victory; then a rearrangement of alliances; then, in spite of Gaston de Foix's brilliant victory at Ravenna in 1512, defeat, and finally expulsion from Italy (1513). Nor had defeat fallen on France in Italy alone; the Spaniards and English had invaded France and had gained victories. Peace came in 1514, and the king's death in 1515.

His nephew, Francis I. (1515-46), succeeded. France and Spain were already jealous rivals, but in this reign they entered upon a struggle which lasted, as a permanent feature of European war and diplomacy, for nearly two hundred years. Francis was young and ambitious, and at once took up the Italian adventure. He crossed the Alps in 1515, and gained a great victory over the Swiss and Milanese at Marignano. The battle not only raised France and the French king to a great pitch of military glory, but also produced the arrangement with the Pope which is known as the Concordat of Bologna, whereby ecclesiastical appointments in France were, in effect, left in the hands of the king. In 1519 the Emperor Maximilian died, and both Francis and the Spanish king, Charles, became candidates for the imperial crown. When Charles was elected as Charles V. (July 1519), his defeated rival prepared for war against him; and this war, in spite of short truces, is the chief fact of the remainder of the reign. It reached no decisive issue, but inflicted untold misery and injury upon France. In 1523 the Constable Bourbon, the greatest of the French nobles, rebelled and joined the emperor. In 1525 Francis was defeated and taken prisoner in the great battle of Pavia. He was carried as a

prisoner to Spain, and at last, in 1526, bought his liberty by signing the humiliating treaty of Madrid. But Francis refused to keep to the terms of the treaty, and the war went on. Twice a peace was arranged (the peace of Cambrai in 1529 and the truce of Nice in 1538). A more important peace was made in 1544 (the peace of Crespy), by which the *status quo* was accepted.

Francis I. died in 1546, and was succeeded by his son, Henry II., and the struggle soon began again. Charles V. attacked Metz in 1552, and his repulse from before its walls was reckoned a deep humiliation for him. Charles abdicated in 1556, and was succeeded (in the Spanish throne, but not in the empire) by Philip II. The French were very sharply defeated at Saint Quentin in 1557, but Francis of Guise, the successful defender of Metz, captured Calais from the English allies of Philip in the following year; and at last the period of the Italian wars was really closed by the peace of Cateau Cambresis (1559). France accepted defeat and abandoned Italy; her chief compensation was the recognition of her claim to the three bishoprics (Metz, Toul, and Verdun) upon her eastern frontier. Henry died in the same year.

The reformation now became the chief influence in France, as in other European countries. Francis I. had at first been favourable to the kindred movements of the renaissance and the reformation. But after the battle of Pavia Francis I. sought to conciliate the Pope and the church by persecuting Protestantism in its various forms. The same policy was carried on by Henry II. But in spite of all, Protestantism grew; it took, not the moderate form of Lutheranism, always ready to cling to the support of the secular powers, but the aggressive and exclusive form of Calvinism. The marked feature of the Protestant movement in France was the very large proportion of nobles who gave in their adherence to it—some, like Coligny, attracted by genuine devotion, others welcoming it as a screen for resisting the crown. The Catholics were often militant, and gathered round the family of the Guises—a family of Lorraine origin, but long naturalized in France. The chief members were Francis the duke and Charles the cardinal. The queen-mother, Catherine de' Medici, tried to trim between the two. Her children, the successive kings of France—Francis II. (1559-60), Charles IX. (1560-74), and Henry III. (1574-89)—were of little real influence on the course of affairs.

The religious wars, which lasted with little intermission for thirty years, began in 1562. Europe has seen few more destructive struggles. Neither side was strong enough to destroy the other: the Protestants were uniformly unsuccessful in battle, but could still maintain the struggle; then at last the idea of toleration, at first acceptable to neither party, came to the front and triumphed. Between 1562 and 1570 three wars were fought, separated by illusory edicts of toleration. But in 1570 the young king, Charles IX., drew near to Coligny, and an entirely new policy was planned. Protestant and Catholic were to unite in a war against Spain, which was then engaged in an attempt to crush the Netherlands. This was the policy which France finally adopted, and which brought her to greatness. But for the present it offended too many interests. The Guises joined with Catherine de' Medici, and determined first to kill Coligny, and afterwards to carry out a general massacre of the Protestants. But this St. Bartholomew massacre (Aug. 24, 1572), though it destroyed many thousands of Protestants, did not annihilate the party, and the war went on with more bitterness than ever.

Charles IX. died in 1574, and was succeeded by his brother, Henry III., but the monarchy lost all control over the country. There were soon three definite parties in France—(1) the Politiques, a new party formed from the old Huguenot party and those Catholics who were willing to accept religious toleration (this party after 1576 recognized the leadership of Henry of Navarre); (2) the Holy League, led by Henry, Duke of Guise, in close alliance with Philip II. of Spain; (3) the Monarchists—those who adhered to the legitimate king, Henry III. The struggle between these three parties is known as the 'war of the three Henrys.' There was the bitterest hatred between Henry III. and Henry of Guise. The king was driven out of Paris by his rebellious subjects in 1588 (the Day of the Barricades), but later in the year he procured the assassination of Duke Henry of Guise and his brother the cardinal. The League now declared its hostility against the king, who was in consequence driven into an alliance with Henry of Navarre. Together they laid siege to Paris in 1589, and seemed on the point of reducing the city by famine when Henry III. was assassinated.

Henry of Navarre was a Protestant; and the League, actively supported by Spain, resisted him vigorously. He made an alliance with Elizabeth of England, and he gained the vic-

tories of Arques (1589) and Ivry (1590). He then proceeded somewhat leisurely to the blockade of Paris; but the siege was raised by the approach of Alexander of Parma, the great Spanish general, from the Netherlands (1591). Again in the next year Henry was foiled by the same antagonist at Rouen. Now Henry, though he could defeat his enemies, could not force them into submission. It was his religion that stood in the way. 'Paris,' he thought, 'was well worth a mass,' and he determined to avow himself a Catholic. The politic farce took place in 1593, and before the end of 1594 he was the unrivalled king of France. With him begins the Bourbon dynasty. The war with Spain, however, was still continued, until the treaty of Vervins in 1598 brought it to a temporary cessation. The latter years of the reign were occupied with domestic policy. Sully, his great minister, improved the administration of the finances, encouraged agriculture, and assisted the king in beating down the power of the nobility. But the two most important domestic incidents of the reign were (1) the Edict of Nantes (1598), whereby an unexampled measure of religious toleration was granted to the Huguenots, and (2) the establishment of the *Parlement*, whereby membership in the judicial bodies called parliaments was made hereditary, on payment of a percentage of income. When he was assassinated in 1610, Henry left only a boy nine years of age to succeed him.

Louis XIII.'s reign lasted from 1610 to 1643, but it was not until the murder of the queen-mother's favourite, D'Ancre, in 1617 that he began really to rule. During nearly the whole of his reign his personal influence was overshadowed by the genius of his great minister Richelieu. The double aim of Richelieu was (1) to centralize and unify all France under the crown, and (2) to establish France as the dominant power in Europe. He pursued both aims with extraordinary tenacity and genius, undeterred by the lukewarm support of the king, the opposition of the royal family, the hatred of the nobles, the suspicions of the Catholic Church, of which he was a cardinal, the armed resistance of the Protestants, and his general unpopularity with the people. In his foreign policy he had to fight against the allied and kindred houses of Spain and Austria. At first he interfered in Germany only incidentally, as, for instance, by the support he gave to Gustavus Adolphus; but after the death of the Swedish king,

France had to take the arena as an avowed combatant (1635). She suffered many reverses, for her armies were unused to the later developments of military science, but before the end of the reign the fortune of war was already turning strongly in her favour (Breisach taken, 1638; Turin taken, 1640; the Spanish navy crushed, 1639; Portugal declared independent of Spain, 1640). In his domestic policy Richelieu crushed the separate political existence of the Protestants by the capture of Rochelle (1627), but showed no desire to destroy the religious toleration that had been granted by the Edict of Nantes. He had continually to watch the plots of the French nobles, who were led by the king's brother, Gaston of Orleans; and though he often seemed likely to be overthrown, he was triumphant in the end. In 1632 Montmorency was killed in the battle of Castelnaudary, and Cinq Mars and De Thou paid for their plots with their heads in 1642. The same policy underlies Richelieu's attacks on the parliaments of Paris and other cities for the representative assemblies of the provinces, his destruction of the nobles' castles, and his establishment of provincial intendants (royal officers for the control of the provinces who are henceforth of the first importance for the general government of the country). The age of Louis XIV. was largely the result of his action.

The reign of Louis XIV. is the longest in France, and perhaps in European history (1643-1715), but it was not until 1661 that the king began really to govern. The first eighteen years of his reign saw the government of the queen-mother and her minister Mazarin. This period was, in foreign policy, a continuation of the action of Richelieu; but meantime the internal politics of France fell into confusion and civil war, from want of a strong hand and will. As a result of the action of Richelieu, France was engaged in practically two wars. In Germany, in close alliance with the Protestant powers of Europe, she was fighting against the power of Austria, while at almost every point of her frontiers she had to resist the designs (military and diplomatic) of Spain. In both wars Mazarin reaped what Richelieu had sown. The French armies were well disciplined and admirably led by Condé and Turenne, and Mazarin was, in diplomacy, a worthy successor of Richelieu. In 1643 Condé broke the Spanish infantry in the great battle of Rocroy in the Netherlands, and in 1644 he gained the great victory of Freiburg on the

Upper Rhine. Other notable events were the battle of Nördlingen in 1645 and the invasion of Bavaria by Turenne in 1646. The result was that the empire consented to make peace, and the Thirty Years' war was ended by the peace of Westphalia (1648). France gained greatly. Her claim to Metz, Toul, and Verdun was recognized, and Alsace was added to her within ill-defined limits; in Italy, Pinerolo was recognized as French.

The empire had made peace, but the war with Spain still remained, and was complicated by the outbreak of civil war. The decisive event was the alliance which Mazarin managed to negotiate with Cromwell. The Spaniards were defeated at the battle of the Dunes (1658), and accepted the peace of the Pyrenees in 1659. Spain ceded territory on the northern frontier of France; but the most important point was a contract of marriage between Louis XIV. and the Infanta of Spain, coupled with a stipulation that the French king should renounce any inheritance of Spanish territory that might come through his wife. Meanwhile, from 1648 to 1653, France had been torn by the civil troubles of the Fronde. This strange movement was a last rally of the discontented and injured elements of French society against the crown. The chief part was taken at first by the Parliament of Paris, whose main object was to extort certain constitutional concessions from the crown. That phase was terminated by the peace of Rueil in 1648; but a new movement was almost immediately begun by the nobles, with the great Condé at their head. The rising was specially directed against Mazarin, who had twice to retire from France; but the movement lacked coherence and definite aim, and though the Frondeurs were helped by Spain, by 1658 Mazarin and the king were triumphant. The political movement had been accompanied by an interesting religious movement—Jansenism. This was no mere piece of political opportunism, but it bears the stamp of the ideas of the time, and may be described as an aristocratic protest against monarchy in the church.

Mazarin died in 1661, and Louis XIV. announced his intention of acting henceforward as his own first minister, and of conducting the government himself; and he persisted in this resolution to his death. At home Louis XIV. was the centre of the most splendid court in Europe. He was for the greater part of his reign genuinely and extremely popular, and the flattery heaped upon him, gross

though it often was, was often really meant. His court was polished and refined, and the standard of manners set there reflected beneficially on all Europe. He was a generous if not a very discriminating patron of letters, and his support of Molière deserves especial mention. He treated his wife, Maria Theresa, with neglect, and a succession of mistresses 'in title' occupied a prominent place at court. In 1683 Maria Theresa died, and in 1684 Louis was secretly married to Madame de Maintenon, who had been governess to his illegitimate children. The early years of his reign saw a splendid and successful effort on the part of his minister Colbert to reorganize the finances and industry of the country. Colbert was a man of great knowledge and energy, and whilst his influence lasted France was the best administered country in Europe. The most questionable part of his work was the establishment of heavy protective tariffs for the newly-planted industries. At the same time the army, the navy, and every department of the state was more carefully organized and directed. The religious history of the reign was also of great importance. The king was a sincere Catholic always, and towards the end of his reign his sincerity darkened into bigotry. The results were seen in the persecution of the Jansenists, who, however, still continued to exist, and to exert considerable influence on public opinion. But worse treatment fell on the Huguenots. They were no longer a danger to the monarchy; their members were peaceful, industrious, active both in trade and commerce; but their independent religious position offended the personal vanity and the religious bigotry of the king. In 1685 the Edict of Nantes (Henry IV.'s great measure of toleration) was withdrawn. The Huguenots were forced into submission or took refuge in exile. The loss thereby occasioned to France (moral, financial, and industrial) was one of the most serious blows sustained during the whole reign. The Catholic Church meantime was flourishing and vigorous, not only by reason of its wealth and position, but also because of the character of its leaders, such as Bossuet, Fénelon, Bourdaloue, and Massillon. In 1682 the declaration of Gallican liberties was issued, defining the limits of the authority of the papacy.

Louis XIV. was very ambitious of military glory, and his reign was full of wars which may be briefly summarized. (1.) On the death of Philip IV., king of Spain,

in 1665 Louis XIV. claimed certain portions of the Spanish Netherlands as descending to his wife by the right of devolution. The claim was resisted, but the country was overrun in a few weeks. To resist this aggression of the French king the Triple Alliance was formed between England, Holland, and Sweden, and in 1660 Louis XIV. accepted the treaty of Aix-la-Chapelle, whereby a strip of the Spanish Netherlands remained in the power of France. (2.) Louis was specially irritated against the Dutch for the part they had played in the Triple Alliance, and besides, he hated Holland for other reasons, both practical and sentimental. The French attack on Holland came in 1672, and at first the French arms carried all before them; but then William the Stadtholder called into existence an alliance of England, Spain, Brandenburg, and the empire, and the French advance was stopped. In 1678 the peace of Nimeguen was made, whereby France gained Franche Comté and other territories from Spain, but the Dutch territory remained intact. But immediately after the peace Louis increased his gains by the quasi-legal procedure of the Courts of Reunion. Large districts on the eastern frontier were annexed, of which Strassburg was the most important. (3.) The power of France was now regarded as dangerous and aggressive by the European states, and the war with the Grand Alliance was the result of this feeling. The English revolution of 1688 brought the Stadtholder of Holland to the throne of England, and William III. was the brain and soul of the alliance, which numbered in its ranks not only England and Holland, but also the empire, Brandenburg, Spain, and eventually Sweden, Denmark, and Savoy. The French were usually victorious both in battles and sieges, but the country was terribly exhausted by the expenses of the war. It was this chiefly which brought about the treaty of Ryswick in 1697, by which France made certain concessions of territory. (4.) In 1700 the death of the Spanish king brought about the war of the Spanish Succession. Charles II., by his will, had left the Spanish possessions to the grandson of Louis XIV. (Philip of Anjou). The union of the French and Spanish territories seemed to unsettle entirely the European balance, and a great coalition was formed to prevent the union (England, Holland, the empire, with certain smaller powers). France struggled against the armies of the coalition, led by Marlborough and Prince Eugene, up

to the battle of Blenheim (1704). But that crushing blow entirely changed the situation; and henceforth France struggled against hopeless odds, constantly asking for a peace which the allies refused to grant. It is only possible to mention the chief battles. Ramillies in 1706, Oudenarde in 1708, Malplaquet in 1709 were all defeats for the French. Only in Spain did they gain victories (Almanza 1707, Villa Viciosa 1710). Peace came unexpectedly at Utrecht in 1713, and was brought about largely by a change of ministry in England.

Louis was succeeded by his great-grandson, Louis XV. His long reign saw the authority and popularity of the French monarchy entirely undermined, and laid the foundation of the destructive part of the revolution. For some years the Duke of Orleans was regent, and he at once reversed the whole policy of Louis XIV. Law, a Scottish exile, was allowed to attempt the reorganization of the finances, but his scheme ended in hopeless failure (1717-21). The Jansenists, persecuted in the last reign, were now liberated and patronized. Most important of all, France renounced her old hostility to England, and joined in a league to oppose the designs of Spain. The Duke of Orleans was served by Dubois, who practically managed all affairs of state; but both regent and minister died in 1723. Louis XV. came nominally of age in 1723, but for some time he was too young to exercise the reality of power, which fell into the hands first of Bourbon and then of Cardinal Fleury.

In 1733 Louis XV. entered upon the war of Polish Succession in support of the claims of his father-in-law, Stanislas Leczinski. France was defeated in the avowed object of the war, but by the peace of Vienna (1738) she converted her effective possession of Lorraine into a recognized and legal power. In 1740 the death of the Emperor Charles VI. brought on the war of the Austrian Succession, in which France, in alliance with Frederick of Prussia, fought against Maria Theresa of Austria and England. The French were defeated at Dettingen in 1743, and had previously been driven from Bavaria. But in 1745 they won the great battle of Fontenoy, and in 1747 the victory of Laffeldt gave them possession of Holland and the Netherlands. But the fighting of the war took place also in many other quarters of Europe, in India, and America.

In 1748 the peace of Aix-la-Chapelle established the *status quo* of the beginning of the war. But France having abandoned

the alliance of Frederick of Prussia for that of Maria Theresa of Austria, the great war came in 1756. There have been few more important wars in European history. The very existence of Prussia was at stake, and between England and France the stake fought for was the possession of India and the New World. The policy of France was weak and purposeless. The French arms were disgraced in Europe (Rossbach 1757), and the English triumphed in India, America, and on the seas. These humiliations were confirmed by the peace of Paris (1763).

The domestic policy of the reign has many features of interest. The Parliament of Paris, so passive under Louis XIV., resisted the edicts of the king, until it was abolished in 1771. The union between the monarchy and the church was very close, and the growing weakness of the ecclesiastical power, culminating in the abolition of the Jesuit order in 1762, was a real blow to royal authority. Meanwhile a series of mistresses 'in title' squandered the resources and misguided the policy of France. The intellectual movement of the time was thoroughly destructive in its tendency. Voltaire, Rousseau, Diderot, Montesquieu, D'Alembert, however much they differed from one another, agreed in opposing the existing régime both in church and state. The forces of the revolution were accumulating. There have been many more oppressive governments than that of France in the 18th century, but few more unstable. The people complained of poverty and unjust taxes; the philosophers attacked all existing institutions, and found no one to answer them. The nobility and clergy had both lost their former hold on the country; the monarchy, absolute in name, was in fact weak, unpopular, disorganized, and tottering to its fall.

The whole reign of Louis XVI. (1774-92) is merely a prelude to the revolution. He was humane, honest, and sincerely anxious for important reforms; but he was deficient in intellectual power, and wholly unequal to the task that was laid upon him. His wife, Marie Antoinette, with many admirable qualities, was a dangerous influence rather than an assistance. The reign opened brightly, for Louis XVI. appointed a ministry of zealous reformers, chief among whom was Turgot. The great interest of his career is that it was the only serious attempt made to introduce such reforms as might have prevented the revolution. Chief among his proposals was an effort to

place an equitable burden of taxation upon the privileged classes. A court cabal, to which Marie Antoinette was a party, procured his downfall in May 1776. He was succeeded in the office of controller of finance by Necker, a German banker, a capable financier, but not a reformer. His efforts to improve the financial system might have had some success if it had not been for the war with England on behalf of her revolted American colonies, which broke out in 1775. This war left the finances of France still further loaded with debt, and Necker's efforts to meet the financial crisis resulted only in his dismissal (1781). The next controller, Calonne, continued in office for some years by an elaborate system of borrowing at high interest. At last, unable to borrow more, he summoned an assembly of the 'Notables' of France (142 nominees of the crown) to consider the situation; but instead of helping him they supported the rapidly-growing demand for the summoning of the States-general—a genuinely representative body. He was dismissed in 1787. His successor, Cardinal Loménie de Brienne, tried to impose taxes by royal edict, but the attempt broke down through the resistance of the Parliament. At last, in 1788, in despair of any other solution, the king summoned the States-general.

The opening of the States-general (May 1789) marks the beginning of the French revolution. It may be noted that it was the product of three different impulses or wants. First, there was the urgent need of reform in the political government of France; next, France was full of vague but strong hopes of a vast social change that should destroy poverty and crime; third, the whole of France, and to some extent of Europe, was fermenting with new hopes, new ideals, which taken together amount to a profound though indefinite religious movement.

The first and mainly political phase lasted down to September 1791. During these months changes of the vastest kind passed over France. The Assembly had three names before its course was run. First it was the States-general; then, on June 17, it took the title of the National Assembly; later it called itself the Constituent Assembly. The leading members were Lafayette, Bailly, Orleans, Mirabeau, Robespierre. It got through a prodigious amount of work, much of it of permanent effect. Feudalism was abolished. The church in France was put under the direct control of the state,

and its property was confiscated. France was divided into departments, and the old provinces were abolished. A constitution was drawn up, on the basis of constitutional monarchy, with a single elective chamber resting on a broad but not universal suffrage. The work was carried out amidst much confusion, caused partly by the risings of the Paris people, partly by the resistance of the king, who, in June 1791, even fled from Paris in order not to be answerable for the work of the Assembly. But in the end he accepted that work, and consented to govern according to the terms of the constitution.

Many men thought that the revolution was at an end, but its most violent phase had not yet begun. Many causes precipitated France towards the Reign of Terror, but the most influential were the outbreak of a great war against Prussia and the empire, and the suspicion that the king sympathized with the foreign enemy. In October 1792 the first (and last) Legislative Assembly met according to the constitution of 1790-1. The three chief parties were the Jacobins (extreme revolutionaries), the Girondists (more moderate), and the Feuillants (reactionaries). In April 1792 war was declared against Austria, but the invasion of the Netherlands ended in failure. Prussia joined with Austria, and the invasion of France was meditated. The chief feeling in Paris was indignation against the suspected treason of the king. On August 10 the palace was stormed by an angry crowd, and the monarchy was declared suspended. In September a large number of prisoners, confined on suspicion of anti-revolutionary designs, were massacred. The chief agents in these sanguinary and important movements were not the Girondists, though they were in office at the time, but the leading Jacobins—Danton foremost of all, and after him Pétion, Marat, and many others. The general result was the establishment of the Jacobins in power and the calling of a new assembly, based on manhood suffrage, to be called the Convention.

The Convention sat from September 1792 to 1795. During its sessions France passed through an amazing transformation. The monarchy was declared abolished, and the republic was proclaimed. Then, by the energy and success of their foreign policy, as well as by their violence at home, the Jacobins gained a complete mastery of France. Louis XVI. was guillotined in January 1793, and Marie Antoinette somewhat

later. The Girondist party was crushed and many of its members executed. The Committee of Public Safety (with Danton as the chief influence at first, and afterwards Robespierre) was the chief agency of government, and Carnot undertook the general direction of the campaign. Dangers of every kind, external and internal, seemed to threaten the revolutionary government with destruction. There was a revolt of the Catholic population of La Vendée, civil war in the centre and south of France, fierce faction fights in Paris, while on the frontiers, Prussia, the empire, England, and Holland were leagued together for the punishment of France. Yet the Jacobins triumphed over all enemies. At the same time a series of remarkable domestic measures were passed. Christianity was declared abolished, and in its place was established first the worship of Reason, and then (by Robespierre) that of the Supreme Being. A new calendar and a new era (commencing in 1792) and a decimal system of weights and measures were adopted. The government was meanwhile supported by measures of the most violent kind, which, taken together, are known to history as the Reign of Terror. This system was worked by Danton, Marat, and Robespierre; but Danton was executed, Marat was assassinated, and for some time Robespierre exercised something like a dictatorship. When, in July 1794, Robespierre himself fell, the Reign of Terror came to an end, and a strong reaction set in towards constitutional government. A new constitution was drawn up, whereby the executive was to be vested in five directors, and the single legislative chamber was to be replaced by a Council of Ancients and a Council of Five Hundred. The rising of Vendémiaire, directed against the Constitution (the constitution of the year III.), was crushed by Napoleon. With this year his prominent career begins, and the history of the battles and campaigns which carried the French arms into every corner of Europe must be looked for under his name. Here the domestic history of France will alone be followed.

We will first note the successive changes in the form of government. (1.) The Directory, established in 1795, lasted until 1799, in spite of much discontent and opposition. In 1799 it was overthrown by the revolution of Brumaire (Nov. 9), which was chiefly the work of Sieyès and Napoleon. (2.) Shortly afterwards (Dec. 24) the constitution of the year VIII. was drawn up, by which the executive was vested in three con-

suls, with Napoleon as first consul, and all the machinery of government was rearranged on more conservative and autocratic principles. (3.) In 1802, after the peace of Amiens, Napoleon was appointed 'First Consul for life,' and the title was ratified by the French people. (4.) In 1804 all veils were cast aside, and Napoleon became emperor of the French, and in December he was crowned at Paris by Pope Pius VII. This title Napoleon maintained until his abdication in 1814 and his exile to Elba. This title he resumed when he landed in France in 1815, and he claimed it still in his exile in St. Helena.

The year 1815 seemed a year of cataclysm. Louis XVIII., brother of Louis XVI. (for the boy king, Louis XVII., had died in prison), succeeded to the throne, promising to govern according to the provision of a Charter of Liberties, and, despite occasional troubles with the church and the people, the new throne seemed firm during his lifetime. Louis XVIII. died in 1824, and his brother Charles X. succeeded him. He was a more ardent champion of religion and political absolutism than his brother, and six years sufficed to bring the monarchy to irretrievable disaster. The conflict came in 1830, through the issue by the king of five *ordonnances*, of which the chief submitted the press to a rigid censorship and made important changes in the character of the constitution. Paris rose; the Tuileries palace was sacked. The king, unable to resist, fled to England. But France was not yet ready to resume the experiment of the republic. The Chamber invited Louis Philippe, a relation of the exiled king, and the son of Philippe Egalité, Duke of Orleans, to become their constitutional king. He ruled until 1848.

The king was served by great ministers, of whom Casimir Périer, Thiers, Guizot, and Soult were the chief, and in many respects France made undeniable progress during his reign. Despite the king's pacific desires, France was engaged in three wars of some importance. A war with Algiers from 1830 to 1847 resulted in the annexation of the country. Other wars were fought with Mexico (1838-9) and with Morocco (1844). But the matter of most importance during this reign was the agitation and violence of public opinion. In 1848 the body of Napoleon was brought from St. Helena and buried amidst great excitement in Paris. The ideas recalled and suggested by the event were certain to be dangerous to the essentially commonplace and bourgeois régime of

Louis Philippe. The Napoleonic tradition was also renewed by the historical work of Thiers. In 1836, and again in 1840, Louis Napoleon attempted to overthrow the government, but failed somewhat ignominiously. In 1847 Guizot was prime minister; but he steadily and firmly resisted all agitation for reform. The movement, however, culminated in 1848. There was a revolutionary outbreak in Paris on February 21. Guizot resigned, but the movement did not subside. Four days later Louis Philippe, thinking resistance hopeless, somewhat pusillanimously abdicated the throne.

A provisional government, consisting of Lamartine, Louis Blanc, and Ledru Rollin, and others, was established. Universal suffrage was declared, and a constitutional assembly summoned. The republic was declared, but the new form of government was only established after several days of desperate street fighting. Louis Napoleon hastened over from England, and was elected president by a great majority. The president used every effort to gain popularity at the expense of his ministers and the Chamber. In December 1851 he dissolved the Assembly by proclamation, made himself dictator, and appealed to the people to ratify what he had done: 7,500,000 voted in his favour and only 650,000 against him. He found himself strong enough to take a further step. In November 1852 he was declared emperor, with the title of Napoleon III. Under this title he reigned for eighteen troubled years. He had announced that 'the empire meant peace,' but the Napoleonic tradition could only be maintained by war. The reign saw therefore a series of wars. (1.) Napoleon III. invaded Italy (1859), and fought against the Austrian power, nominally for the liberation of Italy. But after the great victories of Magenta and Solferino he accepted the peace of Villa Franca (1859), whereby Lombardy became Italian, while France took Savoy and Nice. (2.) In 1863 he entered upon an expedition against Mexico, with a view to re-establishing a great French and Catholic empire there to balance the United States. But the resistance was much greater than was anticipated; European affairs were very threatening, and in 1865 the expedition was abandoned. (3.) Yet these were but a tame prelude to 1870—the real *année terrible* of French and European history. The unscrupulous ambition of two men—Napoleon III. and Bismarck—came into collision. France entered upon the war with the most confident anticipations of success. Then there came the terrible disillusion-

ing. The French were defeated at Weissenburg (Aug. 4, 1870), at Wörth (Aug. 6), at Spicheren (Aug. 6), at Gravelotte (Aug. 18), and, as a result of the last battle, Marshal Bazaine and a large army were cooped up in Metz. An army under Napoleon himself went to their relief, but the French were disastrously defeated at Sedan (Sept. 2), and Napoleon surrendered with 83,000 men.

This terrible news overturned the empire. The republic was proclaimed from the Hôtel de Ville. The Germans claimed concessions of territory; these were refused them, and their army in consequence marched upon Paris. The city, under the direction of the government of National Defence, prepared itself for a heroic resistance. Jules Favre was minister of foreign affairs, Gambetta of the interior, and General Trochu was given the military supervision of Paris. Gambetta escaped from the capital in order to raise armies of relief in the provinces; and though he failed, he threw the greatest energy into the effort. Paris itself was agitated by political passions, and united only in hatred of the enemy. At last famine did its work, and in January 1871 France had to surrender very nearly on the terms that Germany proposed. All Alsace (except Belfort) and Lorraine were to be surrendered, and a war indemnity of £200,000,000 was to be paid. German troops were to remain in France until all was paid off. These terms were embodied in the treaty of Frankfurt (May 10). But before that time the commune had broken out in Paris. Bitter dislike of the surrender, a desire even to prolong the war, political theories, both of the socialist and the anarchist types, and a desire for disorder and plunder, all played their part in producing the amazing outbreak. For some time the insurgents were in possession of the city. The commune began in March 18, 1871, and was not got under until May 21, after vast loss of life and destruction of property.

On Feb. 13, 1871, the National Assembly, elected after the fall of Paris, met at Bordeaux, and assumed the reins of power hitherto held by the government of National Defence. M. Thiers was elected chief of the executive power at Bordeaux on February 17, and received the title of president of the republic; and from this point the history of the third republic begins. In spite of the burdens of the war indemnity, the vitality of the country seemed unimpaired. Within three years the indemnity was cleared off, France was freed from the presence of the

enemy in her territories, and her shattered forces were reorganized.

As soon, however, as the German occupation ended political unanimity disappeared. The radical strength in the Chamber increased, and to meet its demands the ministry was modified. The monarchists in turn attacked the ministry, and a vote of censure forced M. Thiers to tender his resignation in 1873, and Marshal MacMahon, Duc de Magenta, was elected president. In November 1873 a bill was passed which instituted the septennate, thereby confirming MacMahon in the presidency for seven years. His first cabinet was a coalition one, composed of the three monarchical parties. For eighteen months the different aims of these factions prevented action on the constitutional laws; but in 1875 the Assembly adopted laws providing for the constitution of the national legislature, the legislative power to be vested in a Senate and a Chamber of Deputies. This body of laws, generally known as the 'Constitution of 1875,' has lasted without material alteration to the present time. In 1877 President MacMahon was suspected of reactionary designs; but the republican form of government was, nevertheless, greatly consolidated during his tenure of office, and enjoyed the increasing confidence of the nation. On MacMahon's resignation, in 1879, M. Jules Grévy was elected his successor.

After 1879, under various changes of ministry, the policy of the government remained steadily republican. At the instance of M. Jules Ferry, minister of education, a decree was issued in 1880, by which members of any 'unauthorized' religious orders exercising the profession of teaching in any school in France, and all religious orders which would not submit to certain conditions necessary to gain the state sanction, were dissolved. This enactment was aimed chiefly at the Jesuits. In 1884 the constitution and the senatorial electoral system were revised and put upon their present basis.

In 1881 France entered upon an active colonial policy by undertaking a military expedition to Tunis, and establishing a protectorate over that country. In 1883 she enforced a claim of certain rights over the north-western part of Madagascar by taking possession of certain ports. Rapidly extending her influence in spite of considerable reverses, she succeeded in establishing a protectorate over the island in 1885, and in 1896 reduced Madagascar to the rank of a French

possession. The advance of France in Indo-China led to war with China in 1883-5, which resulted in the establishment of a French protectorate over Annam and Tong-king. In 1885 M. Grévy, although his unpopularity was increasing, was re-elected, but resigned in 1887. He was succeeded by M. Sadi Carnot, during whose administration the Panama Canal scandal occurred, involving many prominent men and weakening the government.

The Carnot administration witnessed the most formidable attempt yet made to overthrow the republic. This was the agitation commenced by all the discontented elements in the country, united only by their hostility to the government, under the leadership of General Boulanger (1888). For a time it appeared as if the republic was doomed to fall before a *coup d'état*. But Boulanger lacked decision of character, lost his popularity, and ultimately fled the country. The flight of Boulanger was the death of Boulangism. A strong reaction in favour of the government set in. This growth of republican sentiment received an additional impulse in 1891, when Cardinal Lavergne, the head of the clerical party in France, declared himself in favour of the republic. This declaration was a great blow to the royalists, whose chief strength had lain in their connection with the church.

In 1894 President Carnot was assassinated at Lyons by an Italian anarchist, and was succeeded by M. Casimir-Périer, who resigned in 1895, and was followed by M. Félix Faure. The most notable events of these years were the Franco-Russian *entente*, and after that the Dreyfus case. In 1898 an Anglo-French agreement was signed, settling the territorial boundary at the bend of the Niger, and the Marchand mission was recalled from Fashoda. Upon the death of President Faure, in 1899, Emile Loubet was elected president. In 1899 another Anglo-French agreement was signed, by which France renounced her territory within the Nile basin, but retained her rights on Wadai. A yet more important agreement was signed on April 8, 1904, consisting of a convention with regard to Newfoundland and West Africa, a declaration dealing with Egypt and Morocco, and another relating to Siam, Madagascar, and the New Hebrides. The formal *pourparlers* in regard to this diplomatic recognition of the *entente cordiale* were begun when M. Loubet and M. Delcassé visited England in 1903.

The feelings of mutual friendship and goodwill thus established

were still further strengthened by the visit to Paris of a deputation of British working-men in June and July 1904, by the visit of the British Atlantic fleet under Sir William May to Brest in July 1905, and the return visit of the French Northern squadron under Admiral Caillard to Portsmouth in August, and by the visit of a body of French scholars and scientists to London in the early summer of 1906. During the spring and summer of 1904 acute friction arose between the French republican government and the Vatican, leading to the suspension of diplomatic intercourse and eventually to the formal separation of church and state in France. This was effected by legislative action of the Chamber and Senate during the course of 1905. All state, provincial, and municipal grants to the church were discontinued, property of the state that was held by the church was restored to the former, and teaching by the religious orders was to be gradually suspended. In March 1905 the term of obligatory service in the French army was reduced from three years to two. Considerable friction arose also between France and Germany in the early part of 1905 with regard to Morocco, and at one time the tension became acute. In consequence of the negotiations which led up to the Anglo-French agreement of April 8, 1904, with regard to Morocco, the German emperor deemed it expedient to emphasize the interests which his country possesses in the North African empire; and this he did partly by making a personal visit to Tangier, partly by insisting that the affairs of Morocco should be settled by an international conference, which subsequently met at Algeiras in Spain, and partly by agitating against M. Delcassé, the French minister of foreign affairs, an agitation which only ceased with the definitive resignation of that statesman on June 6, 1905. In January 1906, M. Fallières was elected President of the French republic in succession to M. Loubet.

Bibliography.—The chief histories are those of Henri Martin, Michelet, Dareste, Laval-lée, Sismondi, Kitchin, for the whole or the greater part of the course of French history. Another complete history, under the able editorship of M. Lavissee, but from many different hands, is now appearing (1900, etc.). Full directions as to the books, both on the whole of French history and on special parts or subjects, will be found in Monod's *Bibliographie de l'Histoire de France* (1888). Special recommendation may be given to *L'Histoire de France racontée par les Contemporains*

(1881-90), edited by B. Zeller. The constitutional history of France is excellently given in Gasquet's *Précis des Institutions Politiques et Sociales de l'Ancienne France* (2 vols. 1885). Other useful books are Fustel de Coulanges's *Histoire des Institutions Politiques de l'Ancienne France* (6 vols. 1888-92) and Taine's *Les Origines de la France Contemporaine* (6 vols. 1876-94).

French Language and Literature.—It is customary to begin an account of French literature with the so-called epic period. French epic poetry may be divided into three cycles. The title *chansons de geste* properly belongs to the first series of epic poems, and these are largely concerned with the wars of Charles Martel and his grandson Charlemagne. The most celebrated of the *chansons de geste*, and one of the most ancient, is the *Chanson de Roland*, which dates from the second half of the 11th century. No doubt there had existed a kind of national poetry before, but all traces of it are lost. The *chansons de geste*, as we know them, were the work of the *trouvères* of the 11th and 12th centuries. They are written in decasyllabic verse, and assonance is used. Two kinds of *chansons de geste* are to be noted—(1) those which deal with the sentiment of loyalty to the king, and (2) those which are inspired by feudalism. To the first class belongs the *Chanson de Roland*. An analysis of the poem and a quotation might be useful. In 778 Charlemagne, having failed to take Saragossa, was recrossing the Pyrenees. His rearguard was destroyed by the Gascons, and Roland, warden of the Brittany marches, was slain. Legend transformed these simple facts into a great defeat, in which Roland and his peers are surprised by an army of 400,000 men in the valley of Roncevaux, and after performing prodigies of valour are slain. The traitor of the tale (there is always a traitor in such tales) is called Ganelon. Roland refuses to take the advice of his comrade in arms Olivier to blow his horn in order to recall the retreating emperor. At last he does so, but it is too late. Then he tries to break his sword Durandal, but cannot; and then 'Sur l'herbe verte s'est culchiez adenz Desuz lui met s'espee e l'olifant, Turnat sa teste vers la paiene gent Pur co l'ad fait qui il voeit veirement Que Charles diet e trestute sa gent Lie gentilly quens qu'il fut morz conquérant.'

In modern French prose the foregoing would run: 'Il s'est couché face contre terre sur l'herbe verte. Il met son épée et son cor sur lui

et tourna sa tête vers le peuple païen. Il a fait ceci parce qu'il veut vraiment que Charles dise à tout son peuple que le gentil comte mourut en vainqueur.' We can see here how much nearer the parent Latin stem the language is. If we go further back we find the resemblance naturally greater still. One of the oldest monuments of the French tongue is to be found in what are called the Strassburg oaths. The oath of Louis the German runs as follows:—

'Pro Deo amur et pro cristian poblo et nostro commun salvament, dist di in avant, in quant Deus savir et podir me dunat, si salvarai eo cist meon fradre Karlo et in ajudha et in cadhuna cosa, si cum om per dreit son fradre salvar dift, in o quid il mi altresi fazet, et ab Ludheym nul plaid nunquam prindrai qui meon vol cist meon fradre Karl in damno sit.'

The Breton poems are quite different from the French ones. Even in the middle ages they received the name of *fiction* as opposed to the quasi-historical *chansons de geste*. The Celtic legends cluster round the name of Arthur. It was not till 1170 that they were put into French metrical form by Chrestien de Troyes. There we find the characters with whom Tennyson has made the modern English world so familiar. The third form of epic poetry was written by ecclesiastics, who wanted to resuscitate the legends and heroes of Greek and Latin antiquity. Knowledge of the ancient classics had never completely died out, but the spirit had become unintelligible. The most famous of those pseudo-classical poems is the *Roman d'Alexandre*, by Lambert le Tors and Alexandre de Bernay. It is written in 'Alexandrine,' and the subject is mainly taken from Quintus Curtius. It belongs to the 12th century.

From the epic period we pass to the lyric. It is usually thought that French lyric poetry came from the troubadours of the south, but this is not so. It was not till the middle of the 12th century that the Provençal influence made itself felt. The chief merit of old French songs lies in their form. The sentiment contained in them is somewhat conventional, and always of an amorous kind. Sometimes, however, a fresh and pretty verse is to be found, as, for example, in Gace Brulé. Thibaut, king of Navarre, sometimes strikes a deeper note, and possesses charm. Colin Musset is a wandering minstrel who sings a wandering minstrel's lay. The metrical forms used by these troubadours, as they were called in the north, and troubadours in the south, were many and in-

tricate. It was well for French poetry that their work perished—or, rather, it was bound to perish as soon as genuine inspiration and passion sought utterance in verse. The modern cult for those elaborate and futile forms is mainly confined to Britain, where they have found favour with several clever writers of *vers de société*. In France they have long since ceased to be used, except by inferior poets.

Another form of literature much in vogue during the middle ages was *les fabliaux*. The larger proportion of these came from the East, but some are of pure French origin. In one of them, *Le Vilain Mire* (*mire* = *médecin*), we find the original of Molière's *Médecin Malgré Lui*. Originally the *fabliaux* were prose improvisations; then they were put into verse, and during the 13th century were in great favour with the *bourgeoisie*. The Palais Royal farce is the lineal descendant of the *fabliau*. Besides *fabliaux* there were satires written in various forms. The most famous writer of satire was Rutebeuf (fl. 1255–80). Then there were the Æsopian fables and the fables of Phædrus and Babrius. But during the middle ages all fables were supposed to come from Æsop, and a collection of them was called an *ysopet*. The most ancient *ysopet* was composed in England in the reign of Henry II. by Marie de France. The most famous, however, was the *Roman du Renart*. The French version we possess dates from the end of the 12th century. It is a parody of the *chansons de geste*, and is the first appearance of the *esprit bourgeois* in French literature.

Didactic poetry finds a representative in Guillaume de Lorris (fl. 1236). He wrote the first part of the celebrated *Roman de la Rose*, the second part of which was written forty years afterwards by Jean de Meung. The two parts are totally distinct in inspiration. The first is entirely an amorous allegory; the second is full of satire and shrewd observations about life and society. The poem was hugely successful, and remained so during the 16th century, thanks to an edition of it made by Clément Marot in 1527. There is one great book which sums up the mystic piety of the middle ages, and which is perhaps the work of a Frenchman. This is the *Imitatio Christi*. The book is popularly ascribed to Thomas à Kempis, but some ascribe it to Jean Gerson (1363–1429).

Let us now cast a glance at historical writing. The monasteries had kept going a sort of chronicles, written in Latin; but a certain Mathieu de Vendôme, in the

reign of Louis IX., translated them into French, under the title of *Grandes Chroniques de Saint Denis*, and presented the book to Philippe le Hardi. They reach down to the reign of Louis XI. History proper, however, does not begin till the appearance of Villahardouin's *Conquête de Constantinople* (1207). This work has value, written as it was by a great noble who had taken a prominent part in the fourth crusade. Vigour and sobriety are perhaps the leading characteristics of the work. Next in order we have Joinville's *Histoire de St. Louis*, written in 1309 at the solicitation of Jeanne de Navarre, wife of Philippe le Bel. The chief merit of his book is in its perfect simplicity. After Joinville we come to Froissart's *Chroniques*, which possess something of the charm of Herodotus in their variety, colour, and abundance. The period which he treats extends from 1296 to 1400. After Froissart we have Philippe de Commines (c. 1445–1511). With him begins political history, and to him we owe the picture of the crafty Louis XI. Besides historians we have also story-tellers and translators. The prettiest novel of the middle ages is *Aucassin et Nicolette*, written in the 13th century; the most noteworthy translation, that of a part of Aristotle by Oresme in the 14th.

We now pass to the drama. In France, as in Greece, religion was its mother. Originally the church was the theatre, but by the 12th century the action of the religious play spread into the street. The 13th century has left us two miracle plays—*Le Jeu de St. Nicolas*, by Jean Bodel of Arras, and *Le Miracle de Théophile*, by Rutebeuf. The 14th century gives us the miracle plays of *Notre Dame*; but it is not till the 15th century that the drama finds its full expression in what are called *mystères*, or rather *mistères*. These may be grouped in three divisions: (1) the Old Testament cycle; (2) the New Testament cycle; and (3) the saints' cycle. They were wholly religious in inspiration. All the personages of Scripture from God to the devil were introduced, and also abstractions such as Justice and Peace. The *mystères* continued to be acted till 1548.

The most ancient French comedy is called *Le Jeu de la Feuillée*, and was written by Adam de la Halle, the hunchback of Arras, about the year 1260. Little is known about the origins of French comedy. Some think that, like tragedy, it took its rise from the *fête des fous* and the *fête de l'âne* which was held in the church. In the 14th century there were formed regular societies for the

performance of *farces*, *moralités*, and *soeties*. Such were *Les Enfants sans Souci* and *Les Clercs de la Basoche*. The most famous farce of the 15th century is that of *L'Avocat Pathelin*, the authorship of which is disputed. The greatest lyrical poet of the 15th century in France was, without doubt, François Villon (1431–89?). His *Grand Testament* contains some of the loveliest poetry ever written. We all know his *Ballade des Dames du Temps Jadis* from the admirable translation made of it by Rossetti.

With the 16th century we reach the renaissance and the reform, and the first great name in French literature we meet with is that of Clément Marot (? 1497–1544). His best work is to be found in his *Épîtres*, which are full of wit and charm.

In 1549 appeared a remarkable manifesto called *Défence et Illustration de la Langue Française*. Its author, Joachim Du Bellay, was one of that constellation known as *La Pléiade*, whose brightest star was Ronsard. The aim of Du Bellay's book was to persuade French poets to imitate the poets of Greece and Rome, and to break with the past literature of France. Their motto was *Odi profanum vulgus*. Ronsard (1524–85) published his first volume of verse in 1550. Its success was immediate and immense. Unfortunately for his reputation, he tried to write an epic poem, and produced the *Franciade* (1572), which is only an epic in name. He is a considerable poet, and did much for French versification. His contemporary, Du Bellay, was also a good poet, having much in him of that *douceur angevine* of which he speaks. His best poem is *Les Regrets*—a poem written in Rome. Du Bartas (1544–90), a Protestant, and a disciple of Ronsard, wrote a poem called *La Semaine*, in which he sings about the creation. Its merit, perhaps, is that it found some favour in the eyes of Goethe. To Frenchmen it is unreadable. *Les Tragiques* of D'Aubigné are much in the same case.

The 16th century took a new departure in drama. Jodelle wrote his *Cléopâtre* (1552). This play is the first French tragedy in the specific sense of the term. It is a free imitation of Latin antiquity, Seneca being the model. It was Garnier (1545–1601), however, in his *Les Juives*, who founded the 'classical' style. Jodelle also wrote the first French comedy, *Eugène*; but though a comedy in form, it is really only a farce in feeling. Larivey (1540–1611) came nearer comedy, as Molière understood it.

Bulking hugely among the writers of the 16th century

stands Rabelais (?1495-1553). Gargantua, Pantagruel, Panurge, Picrochole, Triboulet, La dive Pouelle, L'Abbaye de Thélème, are words to conjure with for some people whose love of ideas is stronger than their literary judgment. Rabelais, who is misrepresented when he is called *Le Joyeux Curé de Meudon*, sums up in his personality and writings the spirit of the renaissance struggling to free itself from the discipline of the church. The popular conception of him as a drunkard and buffoon with gleams of wisdom is perfectly erroneous. He was a hard-working scholar, a diplomat, and a reformer. The best qualities of his style are its *verve* and richness. He is French of the French, his very exuberance of obscenity being an essentially French quality. What most annoys one in his style is his love of grotesque neologisms and his catalogues. Perhaps, however, the worst offence of Rabelais is that he created a host of imitators, among whom we may reckon Sterne in *Tristram Shandy*.

Another remarkable name of that epoch is Margaret of Angoulême, queen of Navarre, sister of François I. Her *Heptaméron* is an avowed imitation of the *Decameron* of Boccaccio; but it has qualities of its own. Another great book of the 16th century is the *Institution Chrétienne* of Calvin (1509-64). Its interest lies in this, that it brought theological discussion out of the schools and made it accessible to the 'man in the street.' As a piece of literature it is not worth much—if, indeed, it can be called literature at all—but as writing it takes high rank. So does *La Satire Ménippée* (1594), the bare mention of which is sufficient. Amyot's (1513-93) translation of Plutarch is a work of great merit, and is almost a French classic. Henri Estienne (1532-98), of the great family of the Estienne, in his *Traité de la Conformité du Français avec le Grec*, did good service to the language in protecting it against the invasion of Italian words. Montluc (1503-77) and Brantôme (1527-1614) wrote memoirs, both of them amusing.

The greatest prose writer of the 16th century in France is, without doubt, Montaigne (1533-92). His essays are a mine of useful and useless information—always charming and interesting. He is one of the most readable of writers, and one of the most read. He is the most amiable of moralists, in that he has no prejudices, and is quite willing to try things by their results. His scepticism is universal and complete, his motto being 'Que sais-je?' The leading characteristic of Montaigne is his immense and insatiable curiosity,

which led him to the conviction that human nature is too *ondoyante et diverse* for any one to dare to dogmatize about it.

The 17th century is usually called the great century of French literature, and in some ways, no doubt, it merits the name. In it literature all round reached a high level of excellence, except in the case of lyric poetry. Malherbe (1555-1628), in spite of his pretensions, is not a lyric poet to be placed alongside Ronsard, although he ranks high as a reformer of language. His boast was to have 'dégasconné la cour,' and to him it is customary to refer as the greatest authority on all questions of poetical usage and language. His aim was to clear poets from the influence of Spain and Italy, and also from the affectations of the imitators of Ronsard. In this he succeeded but too well, and for two centuries French poetry remained bound in his chains, till it was released by Victor Hugo. Not but that Malherbe found dissidents. Mathurin Régnier (1573-1613) protested against the hard and fast rules of the reformer, and advised the poet to 'laisser aller sa plume où la verve l'emporte.' But the ideas of Malherbe, afterwards warmly espoused by Boileau, won the day. Everything tended to their success—the unifying sovereignty of Louis XIV., the labours of the grammarian Vaugelas, and the existence of the Academy (founded 1635). As Malherbe was the reformer of French verse, so Balzac (1597-1654) was the reformer of French prose. He was called in his day *l'unique éloquent*, and although, like Malherbe, he was deficient in ideas, he paved the way for Bossuet. One cannot pass the 17th century without making mention of the famous *salons*, first among which comes L'Hôtel de Rambouillet (1620-48), founded by the marchioness of that name. The influence of these *salons* was very great. Men of letters there met men of rank and ladies of high birth and breeding. The result was that the standard of literary taste was raised, and indecency and coarseness had to veil themselves. The influence of *les précieuses*, as they were called, was not by any means an unmixed evil.

The three great names in the dramatic literature of the 17th century are Corneille, Racine, and Molière, and of these the most interesting and important is Molière. French tragedy is not a lucky product of the national genius. It suffers greatly in comparison with Greek tragedy on the one hand, and English on the other. Neither Corneille nor Racine can be for a moment put near Sophocles or Shakespeare.

But Molière stands unrivalled in his own domain, that of satirical comedy. At the beginning of the century the theatre was not a fully popular institution, but was confined to a select circle. With Alexandre Hardy (1500-1631) it became an amusement for all classes. This prolific writer produced some seven hundred pieces, of which forty have come down to us. They are worthless as literature, but interesting as showing what the taste of the public was. Tragedies in the later sense of the word they are not; for none of the so-called unities are observed, the scene shifting from Rome to Athens, and the time sometimes lasting twenty years. Their chief quality is movement—a quality which was lost for two centuries to French tragedy.

Corneille (1606-84) produced his first play (*Médée*, a comedy) in Paris (1629). Richelieu took him under his protection, and made him collaborate with him in the production of dramatic pieces. But Corneille was not docile enough for the great cardinal, and was dismissed with the criticism that he had no *esprit de suite*. A year afterwards he produced the *Cid* (1636), which took Paris by storm. Never in the annals of the drama was play so successful. After the *Cid* came *Horace*, *Cinna*, and *Polyculte*, the last being probably his *chef-d'œuvre*. The characteristic qualities of Corneille's plays are grandeur and heroism—qualities which afterwards degenerated into harshness and stiffness.

Racine's (1639-99) first piece, *Les Frères ennemis*, was produced in 1664. In 1667 he brought out *Andromaque*, which was immensely successful. Then came *Les Plaideurs* (a comedy), *Britannicus*, *Bérénice*, *Bajazet*, *Mithridate*, *Iphigénie*, and *Phèdre*. In 1677 he renounced writing for the stage. Twelve years later he wrote *Esther* at the request of Madame de Maintenon. It was performed by the young ladies of her aristocratic school at St. Cyr. In 1691 he produced his masterpiece, *Athalie*, which fell flat.

Molière (1622-73), whose real name was Jean-Baptiste Poquelin, started a company in conjunction with the Béjart family. In 1659 appeared *Les Précieuses Ridicules*, and from that date onwards his pieces followed in rapid succession. Some of his plays are among the masterpieces of Europe—e.g. *Le Misanthrope*, *Tartuffe*, *L'Avare*. Time, which has dimmed the lustre of French tragedy, has left Molière untouched. The French spirit (if there be such a specific entity) found full expression in him. His mental attitude with regard to religion and morals has always

been the attitude of the French *bourgeoisie*—more inclined to discover hypocrisy than to share enthusiasm. Religious hypocrisy stands for ever pilloried in the person of Tartuffe. Like most French writers for the stage, Molière tended to create types of virtues and vices rather than concrete personalities. As Tartuffe is the typical hypocrite, so is Harpagon the typical miser and Alceste the typical misanthrope. In *Les Femmes Savantes* the 'blue-stockings' has been pitilessly ridiculed. Everything in character that offended against good sense was hateful to Molière. He never hints at any higher criterion. He is full of wit and shrewd observation of life. His last play, *Le Malade Imaginaire*, was written in 1673.

La Fontaine (1621-95) is a writer who will probably always be more thought of in France than elsewhere. There are certain writers whom fully to like one must be in temperamental sympathy with the nation that produces them. Racine and La Fontaine are conspicuous examples of this, and perhaps, in a later day, Alfred de Musset. And it is just because of their Frenchness, if one may say so, that these writers are more intimately loved and admired in France than others whom even their fellow-countrymen would admit to be greater. The beasts in La Fontaine's fables are so very French, so clever, so witty, that they almost cease to be animals. They are men and women masquerading in fur. Our Anglo-Saxon fabulists, on the other hand, tend rather to represent their animals as children. There is a vein of true poetry, however, in La Fontaine, as one can easily discern if one reads, for example, *Le Chêne et le Roseau*.

The 17th century in France is rich in three classes of writers—viz. moralists, writers of memoirs, and writers of sermons. Among moralists, besides Rabelais and Montaigne (who are both really pagan), we have that remarkable writer Pascal (1623-62). It is usual to regard Pascal as a mighty genius, and this conception will probably die hard. His thoughts on religion are highly esteemed by controversialists, but they are in reality the sublime ravings of a scientific mind that has gone mad with terror, and are thoroughly alien to the better religious spirit. His *Provincial Letters* (1656) are usually spoken of as having given a deathblow to the Jesuits. Facts seem to belie this; but it is certain that there is a deal of hard hitting in those wordy epistles.

Descartes (1596-1650) is the philosopher whose thought dominates all the 17th century in

France. His famous *Discours sur la Méthode* (1637) formed the philosophic basis for the art and literature of the reign of Louis XIV. The celebrated 'Cogito, ergo sum,' is the watchword of the age—an age of lofty characters and narrow intellects. For the first time, metaphysic flung her scholastic robes away, and consented to be *simplex munditiis*. She could now be understood by anybody of ordinary intelligence. The *Discours* was widely read, and Cartesians became as common as evolutionists are nowadays.

Among the writers of *mémoires* the name of Cardinal de Retz (1614-79) stands prominent. Though a prince of the church, he had, as he himself confesses, 'l'âme la moins ecclésiastique de l'univers.' La Rochefoucauld (1613-80) relates the events that happened between 1624 and 1652. One can trace in these memoirs the spirit of the man who was afterwards to write the famous maxims. His experience of men and affairs during the Fronde was fully calculated to make him believe that *amour propre* was the basis of all human action. Among the memoir writers of the age must be mentioned Madame de Motteville (1621-89), Mdle. de Montpensier (1627-93), and Madame de Sévigné.

The three great French preachers of the reign of Louis XIV. are Bossuet, Bourdaloue, and Massillon. Bossuet's (1627-1704) was perhaps one of the most powerful and healthy of minds. His work is lacking in depth and charm, but he is the past-master of the 'bow-wow' style. Energy and theological good sense are his most striking characteristics. His chief work is *L'Histoire des Variations des Eglises Protestantes*. Bourdaloue (1632-1704) and Massillon (1663-1742) have only left sermons.

The second half of the 17th century had produced new forms of literary art, and it only remained to theorize them. This task was undertaken by Boileau (1636-1711), who assumed the name of Despréaux, and became the friend of Racine and Molière. In 1660 he wrote his first satire. From 1669-74 he composed most of his *Epistles*, his *Art Poétique*, and the first four cantos of his *Lutrin*. In 1684 he became an Academician. Boileau excels in literary satire. As he himself says, he had 'des quinze ans la haine d'un sot livre.' The principle for which he stands is what Horace calls the *limx labor*, and in this he is the heir of Malherbe. He is also the heir of Malherbe in his fondness for the *mot propre*. His *chef-d'œuvre* is his *Art Poétique*. In it he lays down the principle of an

immutable and impersonal criterion in poetry. Reason, and not imagination, is the guiding genius, and fidelity to nature is the aim. 'Rien n'est beau que le vrai, le vrai seul est aimable.' In the great quarrel of the ancients and the moderns, Boileau was on the side of the ancients, although his real knowledge of the ancients was not very great. His literary doctrines were held sacred for more than a century.

Towards the end of the reign of Louis XIV. there are three writers who mark a period of transition. These are Fénelon, La Bruyère, and Saint-Simon. Fénelon (1651-1715) became archbishop of Cambrai. There he wrote his book, *L'Explication des Maximes des Saints*, which roused the famous quarrel about quietism. *Télémaque* was written for the benefit of his pupil, the Duke of Burgundy. Jean de la Bruyère (1645-96) is a mediocre moralist, but an admirable portrait-painter. He is perhaps the first French writer whom one may call a 'stylist.' His famous work, *Les Caractères*, appeared in 1688. He had a clear perception of the tendencies of his age, although he had not the penetration of a La Rochefoucauld. Montesquieu in his *Lettres Persanes*, and Le Sage in his *Gil Blas*, both derived their inspiration from La Bruyère. Saint-Simon (1675-1755) is perhaps the most astounding writer of memoirs that ever lived. The violence and vigour of his portraiture of people he hated positively make one gasp. His *Mémoires*, which he began to write when he was twenty-one, are full of the most interesting and valuable information, but their literary value is greater than their historical.

With the 18th century a new spirit came into existence. The literature of the preceding age had dealt mainly with man considered as an individual; the 18th century began to consider society as a whole. Science and foreign ideas began to make themselves felt. After the effervescence of the 16th century came the stately pause of the reign of Louis XIV.; but with the 18th century began again the struggle against authority which culminated in the great revolution. As before, the influence of *salons* makes itself felt. La Duchesse du Maine, la Marquise de Lambert, Madame Geoffrin, Madame du Deffand, Mademoiselle de Lespinasse—these ladies all had *salons*, each differing in kind from the other. Fontenelle (1657-1757) was the great *bel esprit* of the day. His best-known work, *Entretiens sur la Pluralité des Mondes* (1686), is an epoch-making book. It is the first attempt at what the French call *vulgarisation*.

Bayle (1647-1706) represents the connecting link between Montaigne and Voltaire. His famous *Dictionnaire* (1695) was the forerunner of Diderot's *Encyclopédie*. The name which dominates all others in the 18th century is Voltaire. It is difficult for us now to understand the all but universal sovereignty which he exercised over the intelligence of Europe. There is not one single book of Voltaire's that is really in the first rank. His plays are merely unreadable, and his historical works—admirable as they are in some ways—are desperately dry-as-dust. In fact, Voltaire is perhaps the greatest example of the irony of literary fate. Hailed by his contemporaries as a god, and tasting to the full the sweets of glory, he has left nothing behind him that is likely to endure, except one thing, and that is his name. He did a big spell of work, and he was the most indefatigable foe that the spirit of superstition and ecclesiasticism ever found. His written work lies dead, but it was deadly. The church in France never really recovered from his onslaughts. The great mass of the French people are Voltairian to this day. That is surely a remarkable tribute to the extent of his influence.

The tragic theatre of the 18th century need not delay the student long. Crébillon (1674-1762) thought that in *Phorreur tragique* lay the secret of power, but he forgot that silly love intrigues detract from the effect he wished to produce. Of Voltaire's tragedies we have already spoken. On the other hand, comedy flourished, though for fifty years writers of comedy restricted themselves to an imitation of Molière. Among these the greatest is Regnard (1655-1709); but Dancourt, Le Sage, Dufresny, Destouches, Piron, and Gresset are distinguished names. In Marivaux (1688-1763) we come to a really original writer. His best works lie between 1730 and 1740—*Le Jeu de l'Amour et du Hasard*, *Les Serments Indiscrets*, *L'Heureux Stratagème*, *Le Legs*, etc. The principal innovation in the work of Marivaux is the importance given to love-making. Another is the fact that all his personages are *honnêtes gens*. This last alone is enough to distinguish him from Regnard. Moreover, he created a style—no mean accomplishment. When one talks of *Mari-vaudage* one means elegance and delicacy not exempt from over-refinement and preciousity.

With Beaumarchais (1732-99) we return to the Molière conception of comedy. The only innovation in the great master's work is the introduction of political satire. Figaro is the great crea-

tion of Beaumarchais. The famous *Barbier de Séville* was produced in 1784, and had an enormous success. There are many celebrated bitter sayings in the play against the nobles—e.g. 'Ils se sont donné la peine de naître.'

In the forefront of the 18th century stand the names of Montesquieu and Buffon. Montesquieu (1689-1755) made his début in the world of letters with his *Lettres Persanes*. They had a huge success, forming, as they do, a brilliant piece of political satire. His next book, *Considérations sur la Grandeur et la Décadence des Romains* (1734), is the first specimen of a philosophy of history from which theology is excluded. His last book, *L'Esprit des Lois* (1748), is the first one in which jurisprudence enters as matter of literature. His style is curiously broken up, but his thoughts are wonderfully true and accurate.

Buffon (1707-88) performed for natural history what Montesquieu did for jurisprudence. He brought it into literature. His *Histoire Naturelle* appeared in 1749. It is a very eloquent work. In a later book, *Discours sur le Style*, Buffon defends his conception of literary style. Its chief characteristic is an ordered magnificence.

The *Encyclopédie* formed a sort of centre for the leading minds of the 18th century. Most of the contributors to that famous work were but mediocre writers, with the exception of one, Diderot. Diderot (1713-84) was perhaps the greatest jack-of-all-trades that the world of letters ever knew. Everything was grist that came to his mill; art, letters, morals, philosophy—everything fell under his facile pen.

The name next in importance to Voltaire's is, without doubt, that of J. J. Rousseau (1712-78). He began his literary career with an attack on science and art (*Discours sur les Sciences et les Arts*), which worked such havoc in men's minds with the idea of an *état de nature* which never existed. His novel, *La Nouvelle Héloïse*, made an enormous sensation; and his treatise on education, *Emile* (1762), produced a very wide effect. The same may be said of his *Contrat Social* (1762), which was a powerful factor in the minds of the revolutionaries of 1789. It is customary in Britain at present to despise Rousseau. His *Confessions* have alienated the puritanical, the reticent, and the hypocritical—a large body. His 'state of nature' has alienated the men of science. But the fact remains that this weak and rather mean man was a great power for good in the world, and an incalculable source of literature. Rousseau's

best disciple was Bernardin de St. Pierre (1757-1814). English and French critics will never be able to agree over the famous prose idyll, *Paul et Virginie* (1787). The redeeming points about the book are the description of tropical scenery, and the pretty, if somewhat too sentimental, love-making of boy and girl.

An account of the literature of the 18th century in France would not be complete without a reference to three more writers at least. These are Le Sage (1668-1747), L'Abbé Prévost (1697-1763), and André Chénier (1762-94). Le Sage, like Saint-Simon, is a survival into the 18th century of the spirit of the 17th. He is not preoccupied with moral ideas, and is contented with portraiture. He may be said to have inaugurated the novel of manners in his famous *Gil Blas*. L'Abbé Prévost may, in like way, be called the creator of the love novel in *Manon Lescaut* (1733). This famous work was almost ignored at the time of its appearance, and it was through his translations of Richardson that Prévost made his name. André Chénier brought into the arid world of 18th century poetry a breath from ancient Greece.

With the 19th century a renaissance takes place in French literature. We are still too near it to appreciate strictly the place which its great writers hold, but we may divide the century into three main periods. The first is the period of preparation, the period of the empire; the second, from 1820 to 1850, is that of the highest creative activity; and the third is that of reaction against the romantic and lyrical tendencies of the previous period.

The great initiator of literature in the 19th century is Chateaubriand (1768-1848). He represents the religious and romantic reaction against the dry, cold spirit of the preceding age. The dominant quality of this writer is sadness—that melancholy which acquired the name of *le mal du siècle*, and which we find in Goethe and Byron. We find it incarnated in René (1802). Chateaubriand's most celebrated work is *Le Génie du Christianisme*—the book which brought into literature the enchantments of the middle ages.

Madame de Staël (1766-1817), on the other hand, represents the continuation of the ideas of the revolution. Her greatest work is *De l'Allemagne* (1810). It was she who first made Germany known in France.

The second period may be said to open with *Les Méditations* of Lamartine (1790-1869). If Chateaubriand wrote the prose of the romantic school, Lamartine wrote

the verse. In both writers there are elements of silliness which we find hard nowadays to accept. Lamartine is regarded by many as the greatest poet France has produced; but if it is so, how far short of first-rate excellence the greatest poetry of France falls! Others would say that the palm belongs to Victor Hugo (1802-85). This astounding writer is perhaps the most complete personification of the 19th century in France. His first work, *Odes et Ballades*, marked him out as a leader in poetry. *Les Orientales* are a date. In *Les Feuilles d'Automne*, *Les Chants du Crépuscule*, *Les Voix Intérieures*, *Les Rayons et les Ombres*, and *Les Contemplations*, the poet enters upon his inheritance. Perhaps the finest part of his work is to be found in *La Légende des Siècles*. His plays are inferior, and his prose works lowest of all. His play *Hernani* (1830) formed the battle-ground of the romanticists and classicists, and gave Théophile Gautier an opportunity for making himself conspicuous. Hugo's novels, *Notre Dame de Paris*, *Les Misérables*, and *Les Travailleurs de la Mer* contain fine passages. He had few ideas, and these mostly commonplace; but his sense of form was astonishing, and though much of his work is already dead, much will remain. He is certainly the greatest French epic poet.

Although Hugo's is perhaps the greatest name in French poetry, that of Alfred de Musset (1810-57) is one more intimately loved perhaps by most Frenchmen. Although a disciple of Hugo, Musset had a distinct vein of his own; and his best-known work, such as *Les Nuits* and *L'Esprit en Dieu*, is much more classical in tone than romantic. If not a great poet, Musset is at any rate one of the most charming that ever wrote. He has a deep feeling for beauty and a most delicate fancy. Like Hugo, he also wrote prose; and Musset's prose, unlike Hugo's, is among the best in the language. His plays are merely delightful—e.g. *Carmosine*. Alfred de Vigny (1797-1863) is one of those poets who have been better appreciated after their death than during their lifetime. His best poems are to be found in a volume called *Destinées*. His guiding mood is a lofty and noble pessimism—not the melancholy of the romanticists, but a philosophical conviction. *La Mort du Loup* is perhaps his best-known poem.

Théophile Gautier (1811-72) it was who stated the famous 'art for art' formula, and no one acted up to it better than he did. Poems were to be like gems, or statues, or pictures. His *Emaux et Camées* exemplifies

this theory. But it is as prose writer that he is chiefly to be remembered. His preface to *Mademoiselle de Maupin* is a masterpiece of criticism.

The 19th century has been great in history: Thierry, Guizot, Thiers, Mignet, Michelet, Renan, Taine, Fustel de Coulanges are all great names. Thierry (1795-1856) started French history on a new basis. His masterpiece is probably the *Récits des Temps Mérovingiens*. Guizot (1787-1874) may be said to have created history as a social science based on accurate research. He endeavoured to show the reciprocal influence of the individual on society and society on the individual. Thiers (1797-1877) wrote two great works, *L'Histoire de la Révolution Française* and *L'Histoire du Consulat et de l'Empire*. The chief quality of his work is intelligence. He was also wonderfully industrious. He wrote history as a clever business man might. Mignet (1796-1884) was a great generalizer. He wrote the history of the revolution in two volumes. Sobriety and concision are his leading characteristics. Michelet (1798-1874) is perhaps the most poetical writer of French history that ever lived. He has no philosophy of his subject, but he is a mighty magician, and can evoke the past as no man has done. He has been called the French Carlyle. Renan (1823-92) is perhaps the finest prose writer of the 19th century in France. He was destined for the priesthood, but gave it up because of his inability to accept the dogmas of Christianity. He wrote *Histoire des Origines du Christianisme*, one volume of which (*La Vie de Jésus*) roused a storm in ecclesiastical quarters. His *Histoire du peuple d'Israël* passed with less comment. His style is rich, delicate, strong, and full of charm. His way of regarding religion marks the great change that the spirit of the 19th century brought about. Blind belief and contemptuous unbelief are alike absent. Taine (1828-93) is chiefly a philosopher. He discards metaphysics, and tries to apply the method of the natural sciences to history and literature. In his *Origines de la France Contemporaine* we see his method rigorously applied. He is a strong and interesting writer. Fustel de Coulanges (1830-89) wrote two books, *La Cité Antique* and *L'Histoire des Institutions Politiques de l'Ancienne France*. His aim was to show the continuity and the slow changes of history. His style is admirable for its conciseness, sobriety, and simplicity.

Criticism in the 19th century is

best represented by Sainte-Beuve (1804-69). His large and luminous intelligence seemed capable of understanding any writer. His *Portraits Littéraires* and his *Causeries du Lundi* are marvels of critical power. He also wrote an admirable history of Port-Royal and the Jansenist movement.

Among the novelists of the 19th century some great names stand out. Of Hugo we have already spoken. George Sand (1804-76) is one of the greatest woman novelists that ever lived. She passed through three styles—the romantic, the socialistic, and the pastoral. From *Indiana* we reach *La Mare au Diable* by way of *Consuelo*. This last is her best-known novel in Britain. Her most distinguishing quality is 'delightfulness.' Her style is facile, abundant, and immensely pleasant. Her outlook upon life is optimistic, and she is full of mild wisdom and comprehension of men and things. Henry Beyle, alias 'Stendhal' (1783-1842), is the first psychological novelist, and a very remarkable writer. His two chief works are *Le Rouge et le Noir* and *La Chartreuse de Parme*. His description of the battle of Waterloo in the last-mentioned work is famous. Prosper Mérimée (1803-79) is chiefly known for his masterpiece *Colomba*, a tale of Corsican vendetta. His style is sober, solid, and brilliant. Balzac (1799-1850) is the greatest master of realistic fiction that France has seen. Like Shakespeare and Molière, he has left a whole gallery of living portraits. He called his work *La Comédie Humaine*. He divided it into categories, each of which contained several books—*Scènes de la Vie Privée*, *Scènes de la Vie de Province*, *Scènes de la Vie Parisienne*, *Scènes de la Vie Politique*, *Scènes de la Vie Militaire*, *Scènes de la Vie de Campagne*, *Études Philosophiques*, *Études Analytiques*. Like Rabelais, he has admirers whose fervency is almost exclusive. There can be no doubt that admiration for Balzac is overdone in Britain. It is one of the many signs that while beautiful and flawless art leaves us cold, we warm to what is full of genial power. Balzac writes indifferent French, but his characters are instinct with life. He cannot paint fine and noble characters—he then becomes stiff and awkward—but he excels in depicting one in whom some quality has become dominant and tyrannical. His *Père Goriot*—perhaps his masterpiece—shows this admirably. Flaubert (1821-80) combines romanticism and realism. He is, on the whole, perhaps the greatest master of style that France has produced. He carried his

ideal of perfection to unparalleled lengths. He suffered from what he himself called *les affres du style*. His two greatest works are *Salammbo*, a Carthaginian romance, and *Madame Bovary*, a story of provincial life.

From Flaubert and Taine there has sprung what is called the 'naturalist' school, of which Zola (1840-1903) is the chief exponent. A strong reaction has already set in against these. It may even come about that the novels of Alexandre Dumas (1802-70) may recover a portion of their vogue. At present they are much more read in England than in France. *Monte Cristo* and *Les Trois Mousquetaires* are more popular here than in the land of their birth. The plays of the great mulatto seem better to bear the brunt of time. They are still occasionally performed at the Comédie Française. On the other hand, the plays of Dumas fils are better known in France than in this country. He is the originator of what may be called 'problem plays.' His novel *La Dame aux Camélias* had an enormous success, as also the play of that name. He is probably the greatest playwright of the last quarter of the 19th century. Guy de Maupassant (1850-93), a great realist, has written perfect short tales. He was a splendid artist. Were we to choose who now are the best writers in France, we should say Anatole France, 'Pierre Loti,' Rostand, and Jules Lemaitre.

The Language.—From the language of the Strassburg oaths (843) to the language written by Rostand there is an immense way. Daughter of Latin, French has become, from something very like her mother, something that is very different. French was the daughter, however, not of the literary Latin of Cicero, but of the colloquial Latin of the Roman settlers in Gaul. We know from Cicero himself that the language he spoke at home was very different from the language he used in the rostrum, and as time went on this divergence increased. Besides the words of Latin origin, there are a considerable number of words that came from the Frankish tongue—e.g. *vassal*, *fief*, *guerre*. The number of original Celtic words is very small—e.g. *alouette* and *cervoise*. In Gaul, popular Latin falling into the hands of two rival races, one in the north and the other in the south, produced two distinct idioms—that of the south being called the *langue d'oc*, and that of the north the *langue d'oïl*. These curious names spring from the custom, not uncommon in the middle ages, of designating languages by the symbol of affirma-

tion. Dante, for example, talks of Italian as *la lingua d'isi*. The modern French *oui* was *oïl* in the north and *oc* in the south. There were in the middle ages four principal dialects of the *langue d'oïl*—Norman, Picard, Burgundian, and French (the language of the Ile de France) in the centre of the triangle formed by the other three. Each of these dialects had its own literature. It was the election of Hugh Capet, duke of France, to be king which settled the question, and made Paris the capital of France, and assured the sovereignty of the dialect of the Ile de France. Gradually the dialects became mere *patois*. The transformation was complete in the 14th century.

The tendency to simplify and reduce the number of cases appeared early in popular Latin. The rough barbarians could not grasp the more delicate shades of meaning expressed by them. In the 6th century we find only two cases instead of six, viz. the nominative and the accusative—e.g. *murus* and *murum*. In old French we therefore find a declension with two cases, and these modelled on the second declension in Latin—the commonest. Thus—

<i>Sing.</i>	<i>Plur.</i>
N. murs (murus)	mur (muri)
A. mur (murum)	murs (muros)

In the 14th century the nominative case was suppressed in both numbers, and the accusative retained.

The golden rule in French etymology is the persistency of the stress accent. It has well been called *l'âme du mot*. In French it always occupies one of two places—either the last syllable in words with a masculine termination (as *aimer*, *finir*), or the penultimate, when the ending is feminine (as *roide*, *voyage*). Similarly, the accent has one of two places in Latin—penultimate when that syllable is long (as *amāre*, *finīre*), and antepenultimate when the penultimate is short (as *rigīdus*, *viāticum*). All words belonging to popular and real French respect the Latin accent; all such words as do not respect the Latin accent are of late and learned origin—e.g. *examen* and *mobile*. These words have also popularly-derived forms—*essaïen* and *mueble*, from the Latin *examen* and *mobilis*.

Bibliography.—1. Middle Ages. —For the *chansons de geste*, consult Léon Gautier, *Les Epopées Françaises* (2nd ed. 1878-92); Gaston Paris, *Histoire Poétique de Charlemagne* (1865). For lyric poetry, consult Clédât, *La Poésie Lyrique et Satirique en France au Moyen Age* (1893). For satirical and didactic poetry, consult Leni-

ent, *La Satire en France au Moyen Age* (1859). For the historians, consult Debidour, *Les Chroniqueurs Français* (1895); Gaston Paris, *Extraits des Chroniqueurs Français* (1892). For the theatre, consult Marius Sepet, *Origines Catholiques du Théâtre Moderne* (1901); Léon Clédât, *Le Théâtre au Moyen Age* (1896).

2. Sixteenth Century.—Consult Darmesteter et Hatzfeld, *Le XVI^e Siècle en France* (1889); Emile Faguet, *Études Littéraires sur le XVI^e Siècle* (1891); Sainte-Beuve, *Tableau de la Poésie Française au XVI^e Siècle* (1828); Egger, *L'Hélianisme en France* (1869); Faguet, *La Tragédie Française au XVI^e Siècle* (new ed. 1895); Emile Chasles, *La Comédie en France au XVI^e Siècle* (1862); Lenient, *La Satire en France au XVI^e Siècle* (1866); Sayous, *Les Écrivains de la Réformation* (1841).

3. Seventeenth Century.—Consult Nisard, *Histoire de la Littérature Française* (1879); Brunetière, *Études Critiques* (1880, etc.); T. Gautier, *Les Grotesques* (1844); V. Cousin, *La Société Française au XVII^e Siècle* (1856); Brunetière, *Les Époques du Théâtre Français, 1636-1830* (1892); Lemaitre, *Cornaille et la Poétique d'Aristote* (1888); Petit de Julleville, *Histoire du Théâtre en France* (3 vols. 1880-6); Sainte-Beuve, *Port Royal* (1840-61); Lemaitre, *Impressions de Théâtre* (1888-98); Brunetière, *L'Évolution des Genres* (1890, etc.); Taine, *Essais de Critique et d'Histoire* (1858); *Nouveaux Essais* (1865).

4. Eighteenth Century.—Consult Villemain, *Tableau de la Littérature au XVIII^e Siècle* (1828-38); Vinet, *Histoire de la Littérature Française au XVIII^e Siècle* (1853); Faguet, *Le XVIII^e Siècle* (1890); Paul Albert, *La Littérature Française au XVIII^e Siècle* (1875); Brunetière *Histoire et Littérature* (1884-91); Lenient, *La Comédie en France au XVIII^e Siècle* (1888); Desnoiresterres, *Voltaire et la Société au XVIII^e Siècle* (1867-76).

5. Nineteenth Century.—Consult Faguet, *Études sur les Écrivains du XIX^e Siècle* (1887), and *Politiques et Moralistes du XIX^e Siècle* (1891, etc.); Brunetière, *L'Évolution de la Poésie Lyrique au XIX^e Siècle* (1894), and *Le Roman Naturaliste* (1883); Sainte-Beuve, *Les Causeries du Lundi* (15 vols. 1857-62), and *Les Nouveaux Lundis* (13 vols. 1863-70); Lemaitre, *Les Contemporains sixième Série*; Pellissier, *The Literary Movement in France during the 19th Century* (Eng. trans. 1897). Good compendiums are those of Demogeot, Doumic, and Lanson.

Philological works by Brachet, Brunot, Diez, Paris, and Littré are useful.

France, JACQUES ANATOLE THIBAUT (1844), French novelist, was born in Paris. With great erudition he combines admirable charm of style. He made his debut with an essay on Alfred de Vigny, in 1868. Then in 1876 we have *Les Noces Corinthiennes*, in 1879 *Jocaste et le Chat Maigre*, and in 1881 *Le Crime de Sylvestre Bonnard*. It was this last work which put France's name in the front rank of contemporary novelists. After that we have a series of delightful little stories, as, for example, *Le Livre de Mon Ami* (1885); and then we come to a very remarkable work called *Thaïs* (1890), a tale of the Egyptian Thebaid. *L'Etui de Nacre* (1892) is a collection of tales. We have next two novels which deal with the life and opinions of the Abbé Jérôme Coignard (1893). *L'Histoire Contemporaine* gives an account of the life and experiences of Monsieur Bergeret (none other than M. France himself), professor of Latin in a provincial town in France. The second volume is the well-known *Le Mannequin d'Osier*; while in the fourth, *Monsieur Bergeret à Paris*, we are in the thick of the Dreyfus affair. *Sur la Pierre Blanche* appeared in 1905.

France, IRE DE. See MAURITIUS.

Francesca da Rimini, daughter of Guido da Polenta, lord of Ravenna, became the wife of the deformed Gianciotto Malatesta da Rimini in terms of the peace made between the two hostile families. Francesca, however, already loved Paolo, half-brother of Gianciotto, who surprised and murdered them both between 1285 and 1289. Dante alludes to their fate in the *Inferno* (v. 73 et seq.); and the story has also been utilized by Paul Heyse, Martin Greif, and Uhland, and was the subject of a play by Stephen Phillips (1899), and of another by D'Annunzio (1901). See Yriarte's *Francesco da Rimini dans la Légende et dans l'Histoire* (1882).

Francesco di Paula (1416-1508), founder of the order of Minimi, born at Paula or Paola in Calabria, near which he lived a hermit's life, and built a chapel in 1436, and a church and monastery in 1454. The order was formally established by Sixtus IV. in 1474. Francesco was canonized by Pope Leo X. in 1519, April 2 being his day. See Roland's *Histoire de St. François de Paule* (1874).

Franceville, sometimes called PORTO VILLA, stn., French Congo, on r. bk. tributary of Ogowe.

Franche-Comté, former prov. of France, extending from the Saône to the Jura Mountains. Its ancient name was Comté de Bourgogne.

Franchise. In English law a franchise and a liberty are synonymous, and mean a royal privilege in the hands of a subject. Much of the learning connected with franchises is obsolete, as they consisted largely of immunities and exemptions from general jurisdiction which are not found convenient in modern times. The highest franchise was the grant of a county palatine, which carried with it almost all the rights of the sovereign within the county. Another important franchise is the grant of a corporation—that is, the grant to a number of persons to be incorporated and subsist as one body, with perpetual succession and a common seal. Other examples of franchises are the right to hold a court, or to have a fair, a market, or a ferry, with the right to take tolls; or to have waifs, wrecks, estrays, treasure-trove, royal fish, and forfeitures, within certain limits; or to have a forest, chase, park, warren, or fishery. For parliamentary franchise, see REPRESENTATION and ELECTIONS.

Francia, or FRANCESCO RAIBOLINI (1450-1517), Italian painter, born at Bologna, was originally a goldsmith, and was director of the Bolognese mint under the Bentivogli. Making the acquaintance of Mantegna, he resolved to turn painter, his first picture being completed in 1490; and soon, showing the influence of Perugino, and later of Raphael, he became famous. His Madonnas are the most appreciated. The work of his son, Giacomo, is often ascribed to him. See J. A. Calvi's *Memorie della Vita e delle Opere di Francesco Raibolini* (1812); Julia Cartwright's *Mantegna and Francia* (1881); G. C. Williamson's *Francesco Raibolini* (1901).

Francia, JOSÉ GASPAR RODRIGUEZ DA (1757-1840), dictator of Paraguay, born at Asuncion. It was while practising as a lawyer in Asuncion that he first rose to a position of influence. On the declaration of Paraguayan independence of Spanish rule (1811), Francia obtained a post in the new government, in 1813 became one of two consuls, and on the death of his colleague became sole ruler, eventually as dictator for life. Absolute prohibition of foreign intercourse, even of a commercial nature, was a feature of his policy. Abolishing the Inquisition, he adopted at the same time strong measures for the repression of all religion. See Rengger and Longchamp's *Reign of Dr. Francia in Paraguay* (1827); Robertson's *Francia's Reign of Terror* (1839); and Bazan's *El Dictador Francia* (1887).

Francillon, ROBERT EDWARD (1841), English novelist, born at

Gloucester; studied law, but devoted his time to literature, and in 1868 his first novel, *Grace Owen's Engagement*, appeared in *Blackwood's Magazine*. Among his subsequent works are *Pearl and Emerald* (1872), *Olympia* (1874), *Strange Waters* (1878), *King or Knave?* (1888), *Queen Cophetua*, *Ropes of Sand*, *Gods and Heroes*. He has also written numerous songs.

Francis, ST., OF ASSISI (1182-1226), founder of the Franciscan order, was the son of Pietro Bernardone, a wealthy travelling merchant of Assisi. In youth, the high spirit which later carried Francis enthusiastically along whatever path of doctrine or practice he chose made him a leader among the young nobles of Assisi. The foremost in their revels, he bore no less gallant a part in the fray between the men of Assisi and Perugia, which resulted in a year's captivity. After his release, when in his twenty-second year, Francis was attacked by a severe illness. He recovered, to find his abounding hope and *joie de vivre* fled, and questions concerning the meaning of life and death beginning to agitate his mind.

No better thing being at hand, he flung himself again into the gay life from which the glory had departed. But even with returning vigour, serious thoughts still held possession of him. His eager aspirations began to marshal themselves for the struggle towards a faith—a struggle which he maintained almost alone. Casting off his old life, he retreated daily into the caves and holes of the rocks to wage his war of the soul, followed only by one friend, whose rare sympathy showed itself in silence. At last, the victory won, in his own picturesque language, he chose 'holy poverty' for his bride. Pursuing his resolution with that carelessness of consequences which was characteristic, he incurred his father's passionate and not unnatural anger; and after various sorrowful and stormy passages, the parental tie was severed. About this time took place the final dedication of Francis to the life he had chosen. Kneeling in the little chapel of St. Damian, near Assisi, he was visited by a vision in which, by a mysterious recognition, the Christ above the altar accepted him as His servant.

Whatever explanation of it modern psychology may offer, this experience is typical of the inspiration of Francis's life, and of its outcome, not in a life of contemplation, but of service, though it was not without a struggle that the choice between these two paths was made. This

ideal of service was carried out by the increasing band of the *Frati Minori* who gathered around Francis, taking the vows of poverty, chastity, and obedience. It was in this essentially altruistic aim that the early Franciscans differed fundamentally from the other religious orders of the time. Finding the spiritual fervour of the church at its ebb, while her wealth and temporal power were at their highest level, the brethren won, through their contempt for wealth and their disinterested lives, an immense influence, which was extended, by their missionary journeys, even into the lands far beyond Italy. So great was this influence, that the church, fearing the non-ecclesiastical character of the new brotherhood, sought to strengthen her hold upon them. The authorization of Pope Innocent III., sought by Francis, and formally granted in 1216, brought with it recommendations contrary to the ideal life of poverty so dear to Francis, and, within its velvet glove, tightened the iron grasp which was finally to crush almost to death the life-principle of the order. For a time, however, all went well. New brethren were received in increasing numbers, and the first chapters of the order—among which that of 1217 was notable—bore testimony to its growing strength, as well as to the unparalleled personal influence of Francis.

In 1219, setting out on a missionary journey to Egypt and Palestine, Francis preached both to the crusading armies and to the inhabitants. Recalled to Italy in 1220, he found that by the efforts of Cardinal Ugolino, and of the two vicars of the order, Matteo di Narni and Gregorio di Napoli, great changes had been effected in regard to multiplication of rules and relaxation of the vow of poverty; while academic learning, which was foreign to the Franciscan principle, was also being encouraged. Reversing the effects of their work as far as possible, Francis waged war with inexorable determination against the new tendency. But the fight was an unequal one, and his long struggle with approaching death drew its bitterness less from bodily suffering than from the sorrow of a betrayed ideal and a disappointed hope. In 1224, two years before the death of Francis, Franciscan chroniclers report as having occurred that miracle of the stigmata concerning the authenticity of which much controversy has arisen. In the high solitude of Monte Alverno, sunk in passionate prayer, and alto-

gether absorbed in ecstatic meditation on the crucified Christ, Francis became conscious of the semblance of the wounds of Christ being impressed upon his own body. Over against the inherent improbability of the legend must be placed the striking unanimity of the brethren (otherwise at variance in their opinions on doctrine and practice) upon its authenticity.

The system of Francis, in which he differed essentially from other spiritual teachers in the Catholic Church of his time, may be summed up, as the teaching of Christ has been summed up by R. L. Stevenson—"What he taught... was not a code of rules, but a ruling spirit; not truths, but a spirit of truth; not views, but a view. What he showed us was an attitude of mind." And impracticable as the 'rule' of Francis may seem, as regards the renunciation of all possessions, etc., it undoubtedly exercised a marvellous spiritual influence in Europe, due largely to the state of the church and the character of the age. The personality of Francis was a unique one. Mystic, poet, nature lover, one whose courtesy and gaiety were the necessary outflow of his mind, in all his instincts knightly—such was the 'cavalier of Christ,' whose compelling charm is more adequately shown in its effects upon his contemporaries than even in the loving words of his biographers. The friendship of Francis and Clare—the foundress of the first community of Franciscan nuns—was an important feature in the lives of both, and continued uninterrupted until the death of the former. Francis was canonized by Pope Gregory IX. in 1228.

His works—including correspondence, sermons, hymns, and other literary remains—were published in 1739. The *Cantico delle Creature* ('Song of Creation') is the most celebrated of his poems.

See *Lives* by St. Bonaventura, Hase (Ger. 1856), Paul Sabatier (Fr.; Eng. trans. 1894), Mrs. Oliphant (1871), Alemany (New York), and Chéranecé (Fr.; Eng. trans. 1887); P. Henry's *Saint François d'Assise* (1903); Boehmer's *Analekten zur Geschichte des Franciscus von Assisi* (1904); also *Francis and Dominic*, by Professor Herkless (1901).

Francis, St., or SALES (1567-1622), Roman Catholic devotional writer, born at Annecy, in France. Entering the church, he became (1602) bishop of Geneva. His efforts to reconvert to Catholicism those districts near Geneva which had embraced the reformed faith met with considerable success, though his conferences with Théodore de Beza, the

great Protestant leader, had no result. Preaching in Paris in 1602, he gained over several Huguenot nobles to the Catholic faith. In 1604 he made the acquaintance of Madame de Chantal, who became the first superior of the *Ordre de la Visitation*, founded by Francis in 1610. A second visit to Paris in 1608 was attended with even more marked success than the first. His chief work, the *Introduction à la Vie Dévote* (1608), won for him a reputation throughout the whole of Christendom. It was followed in 1616 by the *Traité de l'Amour de Dieu*. An edition of his works appeared in 1892. Francis was canonized in 1665 by Pope Alexander VII., January 29 being dedicated to him. See *Lives* by Hamon (1854) and Pérennes (1879); also in English, in Lear's *Christian Biographies* (1877).

Francis I. (1494-1547), king of France, was the son of Charles, Count of Angoulême, and succeeded Louis XII., his father-in-law and uncle, in 1515. His first marriage (to Claude, daughter of Louis XII.) brought about the final incorporation of Brittany into the French monarchy. By his victory at Marignano (1515) he conquered the Milanese, and by the concordat (1516) the Pope and the French king secured a firm hold on the French church. The election of Charles of Spain to the imperial crown in 1519 was followed by a series of wars between France and Germany. Defeated and captured at the battle of Pavia (1525), Francis signed the treaty of Madrid (1526), and made three more wars upon Charles, finally concluding peace at Crespy (1544). During his reign the reformation broke out. Francis, though 'Protestant abroad,' remained 'Catholic at home,' and persecuted the reformers. See Gaston Paris's *François I.* (1888).

Francis II. (1543-60), king of France. On the death of his father (Henry II.) in 1559 Francis succeeded to the French crown, and reigned one year. In 1558 he had married Mary Queen of Scots.

Francis I. (1708-65), German emperor (1745-65), was the son of Leopold, Duke of Lorraine, and in 1736 married Maria Theresa of Austria.

Francis II. (1768-1835), German emperor (1792-1806), first emperor of Austria (1806-35), was born at Florence; he succeeded his father, the Emperor Leopold II. War with France at once broke out (April 20, 1792), and was concluded in 1797 by the peace of Campo Formio, which ended a war in which the Austrians had been severely defeated by Bonaparte. After the Austerlitz campaign, in 1805, Austria

lost heavily; and in 1306 Francis ceased to be German emperor, and became the first emperor of Austria. In spite of the military reforms of the Archduke Charles, her armies were beaten at Wagram (1809); and the treaty of Schönbrunn (1809) completed her downfall. At the Congress of Vienna (1814-15) Austria regained much of her lost territory, and joined the Holy Alliance. Henceforward, till his death, Francis approved of Metternich's policy of 'stability,' and of not permitting any change, whether without or within. So long as the easy-going, popular emperor lived, his subjects remained more or less blind to the evils of the Austrian rule. See Meynert's *Kaiser Franz I.* (1871-3).

Francis, JOHN (1811-82), publisher (1831-81) of the *Athenæum*, was born in London, and entered the service of that journal as a junior clerk (1831). In a few weeks he was made business manager and publisher. He took an active and prominent part in the agitation for the repeal of the advertisement and paper duties, successfully accomplished in 1853 and 1861. From 1872 he also took commercial charge of *Notes and Queries*. See the *Athenæum* for 1882 and 1888.

Francis, SIR PHILIP (1740-1818), supposed author of the *Junius Letters*, was born in Dublin. After holding a junior clerkship under the secretary of state, and two secretaryships, Francis became first clerk in the War Office (1762). The *Letters of Junius* appeared anonymously from 1763. Some of the arguments for the identity of Francis and 'Junius' are these: (1.) Junius knew the War Office well, and in a less degree that of the secretary of state. (2.) He resents the circumstances which led to the resignation of Francis (1772). (3.) Identity of handwriting has been affirmed by the expert Chabot. (4.) Resemblance of character and opinion. The identity has, however, never been proved. Seven years (1774-81) spent in an official position in India, where he became a fierce antagonist of Warren Hastings, and a term of service in the House of Commons, occupied the remaining active years of Francis' life. See *Memoirs* by Parkes and Merivale (1867), and JUNIUS, LETTERS OF.

Franciscans, MINORITES, or LESSER BRETHREN, are a religious order founded by St. Francis of Assisi (1209), under whose name an account of the establishment of the order and its earlier years will be found. The regulations prescribed by St. Francis were severe in the extreme, and the members of the

order would have been mendicants had they acted up to the founder's stern rule of poverty. Even during the life of St. Francis controversies on this injunction arose, and after his death the relaxations decreed by successive Popes gave rise to various divisions of the order. Since the time (1517) of Leo X. and his union bull these divisions have been reduced to three—the Observantists, the Conventuals, and the Capuchins, all of whom belong to the first order of Franciscans; and they are the survivals of a much more numerous division.

The Observantists, called in France Cordeliers, comprised the most rigid section of the old community, and they take the first rank among the Franciscans; their minister-general has pre-eminence. The Conventuals follow the rules of St. Francis with various relaxations. They are independent, their general being elected by the general chapter of the order for the term of six years. The Capuchins, founded by Matteo di Basio in the 16th century, likewise have an independent general. Their founder introduced the *capuche* or pointed cowl in 1528. They were formally recognized, under the title of Capuchins of the order of the Minorites, by Paul III. in 1536. Ochino, one of the first generals of the Capuchins, became a convert to Calvinism. The Franciscan nuns owe their origin to Clare, a noble maiden of Assisi. (See CLARE, ST.) A long array of distinguished theologians and churchmen have belonged to the Franciscan order, including Bonaventura, Alexander of Hales, Duns Scotus, and William of Occam.

Early in the 18th century the Franciscans numbered nearly 120,000 friars with 7,000 houses, and some 30,000 nuns with 900 convents. These numbers are now considerably reduced, but the order remains one of the strongest of the Roman Catholic Church. See Brewer's *Monumenta Franciscana*; Boehmer's *Analekten zur Geschichte des Franciscus von Assisi* (1904); and Herkless's *Francis and Dominic* (1901).

Francis Ferdinand of Austria, ARCHDUKE (1863), nephew of the present emperor of Austria, and heir to the throne; was born at Graz, and is the son of the Archduke Charles Louis, who, on the suicide of the Crown Prince Rudolph in 1889, became heir to the throne, but renounced his claim in favour of his son.

Francis Joseph (1830), emperor of Austria, son of the Archduke Francis (son of Francis I.), succeeded his uncle Ferdinand on Dec. 2, 1848. His accession took place in the midst of revolu-

tion, and war at once broke out with Hungary. Having, with the aid of Russian troops, subdued Hungary, and having simultaneously triumphed over the insurgents in Italy, the emperor carried out reactionary measures. Many of the old abuses were re-established, the rights of nationalities were ignored, and bureaucratic centralization was restored. Neither Italy nor Hungary, however, was permanently crushed, and the settlement of the rivalry of Austria and Prussia was rapidly becoming of vital moment. Early in 1859 events in Italy approached a crisis, and in April Austria made war inevitable by calling upon Piedmont to disarm. Aided by the French, the Italians wrested Lombardy from Austria; and though Napoleon basely deserted the Italians by the end of 1860, they made the union of Italy a foregone conclusion. In 1866 the question of the headship of Germany was decided on the field of Sadowa; and Austria was, moreover, forced to cede Venetia to Italy. The Austrian empire was no longer based upon the theory of German ascendancy, and it was inevitable that the relations of Austria and Hungary should be rearranged. By a famous 'compromise' an Austro-Hungarian state was formed, and in June 1867 the Emperor Francis Joseph was crowned at Pest with the crown of St. Stephen. In spite of many difficulties the dual monarchy still exists, and as long as Francis Joseph lives no serious attempt will probably be made to destroy it. The Empress Elizabeth was murdered in 1898, and the emperor's eldest son Rudolph died in 1889. The heir to the Austrian empire, therefore, is Francis (born 1863), the son of the emperor's brother, Charles Louis. The future of Austria is largely concerned with Eastern Europe, where the growth of nationalities is gradually undermining the rule of the Turk. See Leger's *Histoire d'Autriche-Hongrie*; Auerbach's *Les Races et Nationalités en Autriche-Hongrie*; Alison Phillips's *Modern Europe*.

Francis Joseph Glacier, in the S. Alps of the South Island of New Zealand. It is 8½ m. long; its terminal face is within 14 m. of the sea, and only 705 ft. above sea-level. See Harper's *Pioneer Work in the Alps of New Zealand* (1896).

Frank, ADOLPHE (1809-93), French philosopher, of Jewish descent, was born at Liocourt, Meurthe, and became professor of international law at the Collège de France (1836-86). Among his numerous works are *La Cabale ou Philosophie Religieuse des Hébreux* (1843), *Le Communisme jugé par l'Histoire* (1849), *Réfor-*

mateurs et Publicistes de l'Europe (3 vols. 1863-93), *Éléments de Morale* (7th ed. 1881), *Essais de Critique Philosophique* (1885), and *Philosophie du Droit Civil* (1886). He was editor of an important *Dictionnaire des Sciences Philosophiques* (1843-9, 6 vols.), co-editor of the *Journal des Débats*, and editor of the *Paix Sociale*.

Franck, CÉSAR AUGUSTE (1822-90), French musical com-

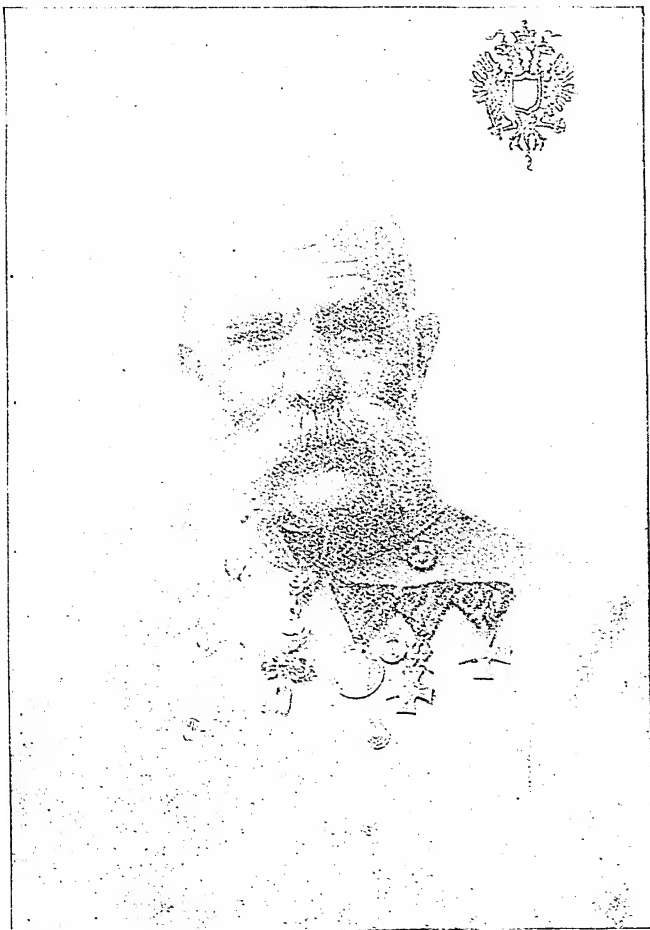
poser, symphony in D (1889), also other works for orchestra and for piano; songs, including *Les Cloches du Soir*; and the operas *Hulda* and *Ghiselle*, performed after his death. See *Lives* in French by Coquard (1891), Derépas (1897), and Baldensperger (1901).

Franck, SEBASTIAN (1499-1542), German writer, was born at Donauwörth. He was a printer at Ulm from 1533 till 1539,

cism is, like Tauler's, eminently practical. He writes in a rich and varied style, at times with telling irony or genial humour, at others in a strain of sadness. See Hegler's excellent book, *Geist und Schrift bei Seb. Franck* (1892), and a monograph in German by Tausch (1893).

Francke, AUGUST HERMANN (1663-1727), German philanthropist and founder of the pietistic movement, born at Lübeck. Impressed by the needs of the neglected and destitute children around him, he organized a small free school in 1695, to which he added an orphanage, a Latin school, and a variety of other educational institutions, the total number of pupils in which numbered 2,300 before his death. They still flourish, having in 1905 over 3,000 pupils. Francke was the author of several scriptural and theological works. See *Lives* by Guericke (1827; Eng. trans. 1837), Kramer (1880-2), and Stein (2nd ed. 1886).

Franco-German War, THE. On July 19, 1870, war was declared between France and Prussia. After the overthrow of Austria in 1866 by the Prussian armies, Napoleon had felt that France was no longer the leading military power on the Continent. In 1870 the suggestion that a Hohenzollern prince was likely to become king of Spain roused French feelings. Though the Hohenzollern candidature was withdrawn, Benedetti, the French ambassador, demanded from King William at Ems a guarantee that the candidature would not be renewed. Bismarck published, with certain omissions, a telegram which he received from the king, giving an account of the interview; and French public opinion demanded war. S. Germany joined Prussia, and Austria and Italy maintained neutrality. While confusion reigned in the French armies, three German armies invaded France, and, after an unimportant action at Saarbrücken, won the battles of Wissemburg (Aug. 4) and Wörth (Aug. 6). The effects of these events were striking. In Paris, Olivier's ministry fell, and Bazaine replaced Leboeuf in command of the army. While MacMahon, who was at the head of one French force, endeavoured to unite with Bazaine, who was near Metz, the Prussians rapidly advanced, won the battles of Vionville, Mars-la-Tour, and Gravelotte (Aug. 16 and 18), prevented the junction between the French armies, and shut up Bazaine in Metz. MacMahon then marched to Sedan, where the Prussians completely overthrew him on September 1. Napoleon yielded himself up to the king of



Francis Joseph, Emperor of Austria.

(Photo by C. Pictner.)

poser, a native of Liège; entered the Conservatoire de Paris in 1837, and taught the organ there from 1872. He at once achieved a measure of popularity with the religious cantata *Ruth* (1846); but he met with no very marked recognition until, in 1873, his oratorio *Rédemption* inaugurated a period of increasing fame, which continued until his death. During this period he produced *Les Béatitudes* (1870-80), an oratorio;

then at Basel. Of his works, the most important are a collection of proverbs, *Sprichwörter* (1541); *Weltbuch* (1534), in which is gathered all the geographical knowledge of his age; a translation of the *Encomium Moriae* of Erasmus (reprinted in 1884); *Germania Chronicon* (1538); and the *Chronica* (1531). Franck, standing aloof from Catholics and Protestants, suffered persecution at the hands of both. His mysti-

Prussia, and the Second Empire came to an end. In Paris the news of Sedan led to a revolution: the empress fled, and a government of National Defence was set up under Trochu, Favre, and Gambetta.

With the fall of Napoleon's empire the war entered upon a new phase. On September 15 the army of the Crown Prince of Prussia arrived before Paris, and the siege of the French capital began. Meanwhile in various parts of France efforts were made to defeat the German armies. But in spite of occasional successes, victory declared itself on the side of the Germans. Metz capitulated on October 27, and General d'Aurelle de Paladines, after winning a victory at Coulmiers on November 9, was himself overthrown a few weeks later in a series of battles near Orleans. Bourbaki's attempt to create a diversion by advancing into Germany ended in total failure; while Chanzy's gallant efforts round Le Mans proved insufficient to affect the issue of the war. Paris capitulated on Jan. 28, 1871, and peace was signed at Frankfort-on-Main on May 10, 1871. Alsace-Lorraine, Metz, and Strassburg were ceded by France, and a war indemnity of £200,000,000 was imposed on the conquered country. On Jan. 18, 1871, King William of Prussia was proclaimed at Versailles German emperor. See Maurice's *The Franco-German War* (1900).

Franconia. On the break-up of the Carolingian empire, the East Frank realm, or Austrasia, fell into four divisions, which were known as the duchies of Franconia, Saxony, Bavaria, and Swabia. With the death of the Emperor Conrad I. in 918 ended the Franconian dynasty, and the Saxon line took its place. A hundred years later these national dukedoms became broken up, and there were no longer dukes in Franconia. In 1501, when Maximilian I. divided Germany into circles, he used the term Franconia to denote a circle which included the bishoprics of Würzburg, Bamberg, and Eichstätt, the abbey of Schönbach, the district of Mergentheim, the principalities of Baireuth and Ansbach, and certain imperial towns. After 1806, when the Holy Roman empire ceased, the term Franconia fell into disuse. At the present time it is represented by the Bavarian divisions of Upper, Middle, and Lower Franconia.

Franks-tireurs. During the Franco-German war numbers of French peasants took up arms and formed irregular corps, called *franks-tireurs*, whom the Germans, however, refused to recognize as forming part of the regular French force, and when mem-

bers of this irregular organization were captured they were at once shot. When, after the capitulation of Metz (Oct. 27, 1870), defensive operations were undertaken by Gambetta, the *franks-tireurs* were organized, and proved a valuable addition to the *levée-en-masse* of all Frenchmen capable of bearing arms.

Franecker, tn., prov. Friesland, Netherlands, 11 m. by rail W. by S. of Leeuwarden; was from 1585 to 1811 the seat of a university. Franecker has a 15th century church and town hall. Pop. (1899) 7,114.

Frangipani, a famous family of the Roman nobility, dates its authentic history from Leo Frangipani in 1014. Cencio Frangipani was one of the leaders of the Ghibelline party early in the 12th century. More than a century later, Giovanni Frangipani, lord of Astura, betrayed Conradin of Swabia to Charles of Anjou (1268). A branch of the family survives in the province of Udine. The Croatian Frangipani are of Slavonic origin, and probably unconnected with the Roman family.

Frangula, or **ALDER BUCKTHORN** (*Rhamnus frangula*), is a native British shrub, about eight feet in height, with slender stem, and entire obovate leaves, very smooth and glossy. Inconspicuous greenish-white flowers are followed by nearly black, globular berries. The wood of this shrub is sometimes known as black dogwood.

Frank-almoigne, or **FREE ALMS**, is the name of an ancient tenure of lands in England granted to religious corporations. See **TEXTURE**.

Frankenberg, tn., kingdom of Saxony, prov. Zwickau, 11 m. by rail N.E. of Chemnitz; is the seat of textile (woollen, cotton, silk) industries, calico printing, and dyeing. Pop. (1900) 12,726.

Frankenhausen, tn., Germany, in the principality of Schwarzburg-Rudolstadt, at the S. foot of the Kyffhäuser, 12 m. by rail S.E. of Nordhausen; is visited for its saline waters. Here the revolted peasants, led by the Anabaptist Münster, were defeated in 1525. Pop. (1900) 6,374.

Frankenia, a genus of hardy and half-hardy dwarf-growing shrubby plants belonging to the order *Frankeniaceæ*. They are evergreen, not unlike heaths in general appearance, and are easily cultivated in sunny situations in light soil. The smooth sea-heath (*F. lewis*) is a native species, found in salt marshes on the east coast of England. It bears rose-coloured flowers in summer. Another species worth growing in gardens is *F. galvarentana*, which bears red flowers, and formerly grew wild in Britain.

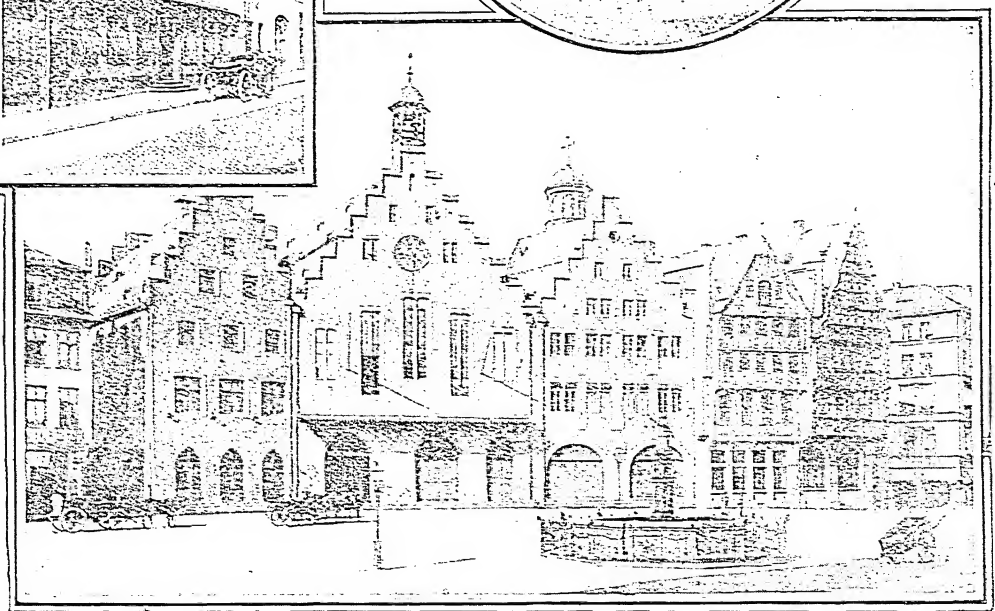
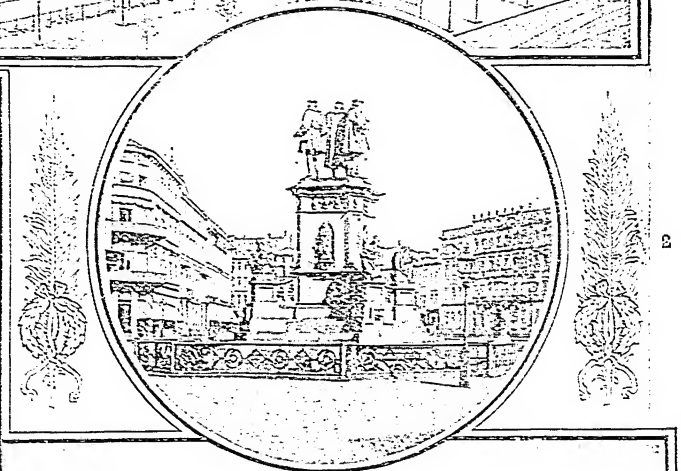
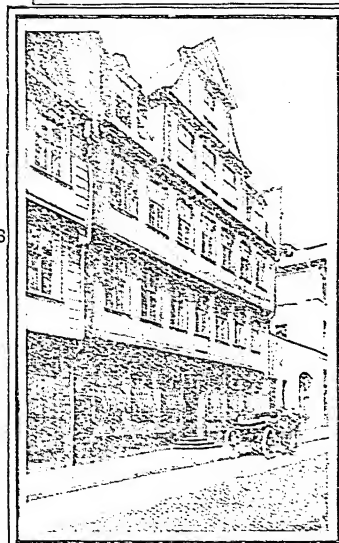
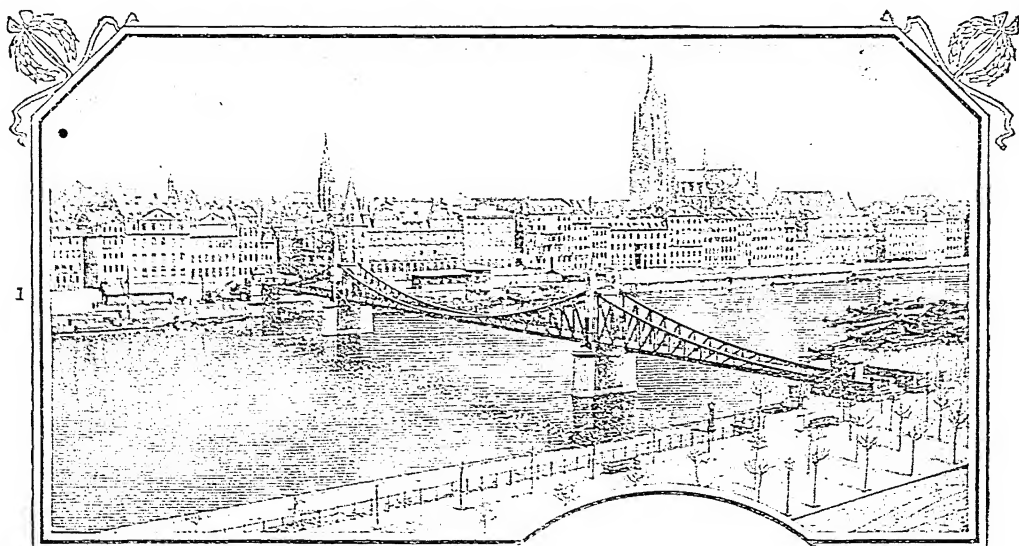
Frankenstein, tn., prov. Silesia, Prussia, 45 m. by rail S.W. of Breslau. It has linen and woollen factories. Pop. 8,100.

Frankenthal, tn., Baaria, Palatinate prov., 8 m. N.W. of Mannheim, and on the l. bk. of the Rhine, with engineering shops, bell foundries, sugar factories, and breweries. Pop. (1900) 16,899.

Frankenwald, mountainous region of Germany, the connecting link between the Thüringer Wald and the Fichtelgebirge. Almost entirely within the N.E. of Bavaria, it forms an undulating plateau, with a mean elevation of 2,000 ft.

Frankfort. (1.) Town, cap. of Clinton co., Indiana, U.S.A., 24 m. S.E. of Lafayette; has manufactures of furniture. Pop. (1900) 7,100. (2.) City, Kentucky, U.S.A., the co. seat of Franklin co., and the cap. of the state, on the Kentucky R., about 70 m. S.S.W. of Cincinnati. Pop. (1900) 9,487.

Frankfort-on-the-Main, tn., Prussia, prov. Hesse-Nassau, on the Main, 22 m. above its confluence with the Rhine. Certain of the streets adjacent to the Main still retain their mediæval characteristics, but the quarters farther north (the Zeil) wear an entirely modern appearance, and are adorned with many imposing buildings, such as the fine central railway station (1883-8), post office, law courts, opera house. In the older part of the city the most noteworthy edifices and institutions are the house in which Goethe was born, with a Goethe museum attached (since 1897); the Römer, a complex of ancient buildings, which serve as town hall, and embrace the hall in which the German emperors were formerly elected, and that in which they dined in state with the electors, as described in Goethe's *Wahrheit und Dichtung*; the cathedral, founded in 850, but mostly rebuilt at subsequent periods; the Saalhof, which stands on the site of the palace of the Carolingian emperors; the Academy of Social Sciences, opened in 1901, with a university character; the house in which Schopenhauer lived; the ancestral house of the Rothschilds; the old Main bridge; and the Justitia fountain (1548). The Senckenberg Foundation (1768); the Thurn and Taxis palace (1731), now used by the post office, but down to 1866 the meeting-place of the German Imperial Diet; two conservatories of music; the commercial high school; and in the suburb of Sachsenhausen, on the opposite (left) bank of the Main, the Städelsche Institute, which embraces a picture gallery, art collections, and an art school, all figure prominently. Frankfort, especially since the in-



Views in Frankfort-on-the-Main.

1. General view from the river. 2. The Gutenberg Monument. 3. Goethe's house. 4. The Römer.

corporation of Bockenheim (on the N.W.) in 1895, has developed considerable industrial activity, the principal branches being the production of machinery, chemicals, perfumes, hats, printing, lithography, and brewing. Gardening is extensively carried on. But it is to its character as a commercial and financial centre that Frankfort owes its special importance among German towns. One-tenth of the population are Jews; but the old *ghetto*, or Jewish quarter, described in Heine's *Rabbi von Bacharach*, has now entirely disappeared. The fairs, of which there were two, were among the most important in Europe. Pop. (1900) 288,989; (1905) 334,951. In the end of the 8th century Charlemagne built himself a palace at the 'ford of the Franks,' on the river Main, and out of this grew eventually the city of Frankfort. By the treaty of Verdun (843) the town was made the capital of the East Frankish empire (i.e. Germany). From 1152 to 1806 the German emperors were always elected here, and from 1562 also crowned. In 1810 the French made it the capital of the new grand-duchy of Frankfort. From 1816 to 1866 it was the meeting-place of the German Diet, and in 1848-9 of the German National Assembly. In 1866 it was incorporated with the Prussian province of Hesse-Nassau; and in 1871 the peace which terminated the war between Germany and France was signed in the town.

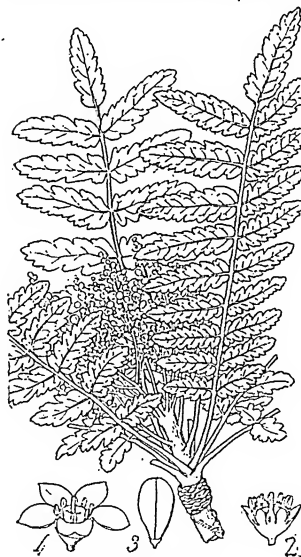
Frankfort-on-the-Oder, tn., Prussia, prov. Brandenburg, on the Oder, 50 m. by rail E. by S. of Berlin. A handsome new quarter has grown up outside the former city walls. The town hall (1607-10), the church of St. Mary (13th century), and the government buildings (1900) are the most notable features. Frankfort was famous for its three fairs, and as a centre of the trade with Poland. From 1566 to 1811 it was the seat of a university (now at Breslau). Its industries include the manufacture of machinery, iron and steel goods, chemicals, tobacco, etc. Heinrich von Kleist was born here in 1776. Pop. (1900) 61,852; (1905) 64,301.

Frankincense (*Olibanum*) is a gum resin obtained from *Boswellia Carteri*, of the order Burseraceae, and brought chiefly from Somaliland. It occurs in small, roundish tears, colourless to reddish, covered with a white powder; its odour is balsamic, and its taste bitter. It burns with a fragrant odour, and is used in incense, fumigating powders, etc.

Franking of Letters, a system authorized by Parliament in 1764 by which any member of either House of Parliament might send

free by post ten letters per day, his signature upon the envelope being the only condition. Fifteen letters per day might also be received free by a member. On the inauguration of penny postage in 1840 the system was abolished. In the United States it persisted until 1873.

Frankl, Ludwig August, Baron von Hochwart (1810-94), poet, of Jewish parentage, born at Chrast, in Bohemia. His journal, *Sonntagsblätter*, founded in 1842, was suppressed in 1848. He achieved a considerable reputation through his poetical works, among which are *Das Habsburglied* (1832); *Christoforo Colombo* (1836), an epic; *Don Juan de Austria* (1846); *Tragische Könige* (1876); *Lyrische Gedichte* (5th ed. 1880); *Episches und Lyrisches* (1890); and *Gusle* (1852), trans. of Servian national songs. His poem, *Die Universität*, achieved an unexampled popularity in 1848. His collected poems, with the exception of the *Satires*, were published at Vienna in 1880.



Frankincense.

1, Flower; 2, section, petals removed; 3, fruit.

Frankland, Sir Edward (1825-99), English chemist, born at Churchton, near Lancaster; studied under Bunsen at Marburg, and Liebig at Giessen. Among his contributions to chemical science was the 'Theory of Valency'—i.e. the conclusion that each atom of an elementary substance possesses a clearly limited power of saturation, so that only a correspondingly limited number of atoms of other elements can be attached to it. As a member of the second Royal Commission on

the Pollution of Rivers (1868 *et seq.*), Frankland did valuable work. In 1863 he became professor of chemistry at the Royal Institution, London, and in 1865 at the Royal College of Chemistry. His name is associated with that of Sir Norman Lockyer in spectroscopic researches, which resulted in the conclusion that the photosphere of the sun is gaseous. The discovery of helium in the sun was also the result of their joint labours.

Frankland, Percy Faraday (1858), English chemist, was born at London, and became successively demonstrator and lecturer on chemistry in the Royal School of Mines, London (1880-8); professor of chemistry, University College, Dundee (1883-94); in the Mason College, Birmingham (1894-1900); and in the University of Birmingham (1900). Many of his researches, especially those in bacteriology, have been carried out with the collaboration of Mrs. Frankland. His chief works are *Agricultural Chemical Analysis* (1883); *Our Secret Friends and Foes* (1894); *Micro-organisms in Water* (1894); and *Life of Pasteur* (1897).

Frankland, Mrs. Percy Faraday, née Grace C. Toyne (1858), authoress, bacteriologist, and journalist, wife of Professor P. F. Frankland; born at Wimbledon. Mrs. Frankland has written chiefly on micro-organisms; has carried out original research in bacteriology; and is joint author with her husband of *Micro-organisms in Water* (1894), *Bacteria in Daily Life* (1903), and other works.

Franklin, in feudal times the owner of freehold land—i.e. land free from the ordinary dues paid to a feudal lord, and held direct from the sovereign. At first the position of the franklin corresponded roughly with that of a modern country squire, and it is this type which Chaucer describes in his *Canterbury Tales*. Later, however, the franklin seems to have represented rather the yeoman farmer farming his own land.

Franklin. (1.) Town, Norfolk co., Massachusetts, U.S.A., 27 m. S.W. of Boston; has manufactures of straw goods and rubber shoes. Pop. (1900) 5,017. (2.) City, Merrimack co., New Hampshire, U.S.A., on the Merrimack R., 22 m. N.W. of Concord. Here Daniel Webster was born. Pop. (1900) 5,846. (3.) Town, cap. of Venango co., Pennsylvania, U.S.A., on the Allegheny R., 123 m. by rail N. of Pittsburg. Franklin is the centre of the great oil region of the state, and has oil refineries, flour mills, brick works, machine shops, and manufactures of steel castings. Pop. (1900) 7,317.

Franklin, BENJAMIN (1706-90), American statesman and philosopher, born in Boston, Massachusetts. In 1725 he sailed for London, where he was employed at his trade of printer for eighteen months. Returning to Philadelphia, he started business as a printer. Franklin, in the midst of his strenuous labour, never lost sight of intellectual culture. He was an assiduous student, and his desire to make his power felt, as much as a keen eye to self-interest, led him to purchase the *Pennsylvania Gazette* (1729). Three years afterwards he established his reputation by publishing *Poor Richard's Almanac*, a form of literature quite unique in its day, which had a marvelous circulation and a European fame. Franklin also devoted a portion of his time to scientific pursuits. The discovery of the Leyden jar (1745) led him to investigate the nature of electricity, and the part played in nature by the new power. He came to the conclusion that electricity and lightning were identical, which led him to devise his famous lightning rod. But Franklin's attention was diverted from the study of nature to the grave political problems springing up in America. A member of the Assembly of Pennsylvania, he was sent to London (1757) to place before the king a report of the grievances which the colony suffered at the hands of the governor. Franklin in 1764 was sent again to London, where he took part in the agitation against the Stamp Act. In 1771 he predicted the separation of the colonies from the mother country, though while in London he did his utmost to prevent the dispute from ending in disaster. He returned to America, May 5, 1775, and took part in the deliberations which resulted in the Declaration of American Independence. From 1776 to 1785 he represented the United States in Europe, being from 1778 accredited minister to France; in 1783 he assisted in the settlement of the treaty of Paris. To this day Franklin remains a type of American character. To him undoubtedly belongs the credit of bringing France into the war, thereby securing the ultimate success of the colonies and the independence of the United States. His knowledge of human nature, his marvellous patience, his insight into the various springs of political life, his simplicity of life, his quaint dignity, his reputation as a man of sense, his unpretentious character—these are the qualities that gave him a unique ascendancy over the French mind. The standard edition of his works is

that in ten volumes, edited by Bigelow (1887-9). See his *Autobiography* (ed. Bigelow, 1868; ed. W. Macdonald, 1905), and *Lives* by Parton (1867), M'Master (1887), and Morse (1889).

Franklin, SIR JOHN (1786-1847), English Arctic explorer, was born at Spilsby, Lincolnshire. He served at the battle of Copenhagen in 1801. On his return to England he joined Captain Matthew Flinders, his cousin, for a voyage of discovery into Australian waters. Franklin was next present at Dance's famous repulse of Linois in February 1804. In the following year he took part in the battle of Trafalgar, and in 1814 was slightly wounded in an attack upon New Orleans. In 1818 he was appointed to command the *Trent* in the Arctic expedition under Captain David Buchan. In the following year he led an overland expedition to ascertain the position of the mouth of the Coppermine River and the adjacent coasts. During 1825-7 Franklin was again in the Arctic regions, and on his return was knighted. On May 18, 1845, he sailed in the *Erebus*, with the *Terror*, Captain F. R. M. Crozier, in company, on an attempt to discover a north-west passage through Lancaster Sound and Bering Strait. The ships were last seen on July 26, 1845, in Baffin's Bay. An expedition started in 1848 in search of Franklin and his party. Until 1857 various other expeditions were sent out with the same object—all of them without success. Traces of the party were at length found in 1859 by M'Clinck, with a record of the abandonment of the *Erebus* and *Terror*, and of the death of Sir John Franklin on June 11, 1847. Franklin did, however, succeed in demonstrating the existence of the long-sought north-west passage. His voyages are described in his *Narrative of a Journey to the Shores of the Polar Sea* (1823) and *Narrative of a Second Expedition to the Shores of the Polar Sea* (1828), and in F. W. Beechey's *Voyage of Discovery towards the North Pole* (1843). See *Life* by A. H. Markham (1890).

Frank-marriage. In old English law, if lands were granted to a man and his wife to hold 'in frank-marriage,' the wife being the daughter or cousin of the grantor, this created an estate in special tail—i.e. the lands were conveyed to the husband and wife and the heirs of their two bodies begotten.

Frank-pledge. After the first series of Danish invasions (855-897) measures were taken by the English for preserving order. Every

man was compelled to have some one to answer for him. In many parts of England a number of men would form an association, the members of which were bound to do their utmost to bring to justice any one of their body who broke the peace. The Normans adopted this system, called it frank-pledge, and made it more severe.

Franks, THE, a confederation of tribes who are found about 250 A.D. settled in the lower Rhine valley, and grouped shortly afterwards as Salian Franks (on the lower Rhine) and Riparian Franks (on the middle Rhine). After the accession of Clovis, in 481, to the throne of the Salian Franks, the dependence upon Rome, which had lasted since the early part of the 5th century, came to an end. Clovis, having occupied the Seine valley, overthrew (496) the Alemanni, and then became an orthodox Christian. This induced the church to throw all its influence on the side of the Salian Franks, who by 510 had conquered or absorbed all the other Frankish tribes. At that time the kingdom of Clovis included most of modern France north of the Loire. The next epoch in the history of the Franks was marked by their division (567) into the Austrasian and Neustrian Franks, their struggle for supremacy, and their final separation. The careers of Fredegond and Brunhilda illustrate the hostility between the Austrasian and Neustrian Franks, and the death of Brunhilda in 613 marks the temporary victory of the Austrasians. The Austrasian mayors of the palace arose, and the battle of Testry in 687 established the victory of the eastern over the western division, and was the deathblow of the Merovingian dynasty. The rise of the Carolingians led to the formation of the empire of Charles the Great; but on his death quarrels ensued among his descendants, and finally, by the treaty of Verdun (843), the empire was dismembered. Three monarchies then arose, one of which was that of Germany, another that of France, and the third that of Burgundy and Lorraine. See L. Sergeant's *The Franks* (1898); also FRANCE.

Franks, SIR AUGUSTUS WOLASTON (1826-97), English antiquary, born at Geneva, Switzerland; became assistant in the antiquities department of the British Museum (1851); he retired in 1896. A specialist in mediæval art, especially pottery, he also made important collections of Eastern work of various kinds, and was an authority on classical art. His most important publication is his *Catalogue of Oriental Porcelain and Pottery* (1876 and 1878).

Fransche Hoek, small valley in Cape Colony, near Stellenbosch, 35 m. E. of Cape Town; is famous for its grapes.

Franz, ROBERT (1815-92), German song-composer, born at Halle, where he was appointed city organist (1841), master of music to the university, and director of the symphony concerts (1859). His first book of songs (1843) reached a high level of excellence, worthily maintained by his later songs, which raised the total number to about 250. Franz also edited Bach's *Matthäus Passion* and *Magnificat*, Handel's *Messiah*, Astorga's *Stabat Mater*, and other works. Deafness compelled his retirement in 1868.

Franzen, FRANS MICHAEL (1772-1847), Swedish author, born at Uleåborg, in Finland, was elected librarian at the University of Åbo (1795), in 1798 professor of literature, and in 1801

Franz Josef. See FRANCIS JOSEPH.

Franz Josef Land, archipelago of some sixty islands, 42° to 64° E. and from 79° 40' to 83° N., situated about 250 m. to the E. of Spitzbergen. Nearly the whole group is covered with snow-clad glaciers. Franz Josef Land was discovered in 1873 by Payer and Weyprecht. Later explorers have shown that much of what was then believed to be continuous land is broken up into islands. In the summer of 1880 Mr. Leigh Smith surveyed much of the S. coast. In 1894 the 'Jackson-Harmsworth Expedition' formed a settlement at Cape Flora, where they remained for three and a half years (1894-7), occupied with scientific observations. Here in 1896 (June 17) occurred the dramatic meeting with Nansen and Johansen, who had spent the previous year in the northern part of the archi-

pelago. his old home (he calls it Halb-Asien) and the strange charm of its scenery, particularly in *Aus Halb-Asien* (6 vols. 1876-90) and in his very remarkable novel, *Ein Kampf ums Recht* (1882). Other notable novels are *Die Juden von Barnow* (1877); *Mein Franz* (in verse, 1883); *Judith Trachtenberg* (1894); *Stille Geschichten* (1880); *Moschko von Parma* (1880); *Leib Weihnachtskuchen und sein Kind* (1896); and *Allerlei Geister* (1897). There are English translations of the best of these.

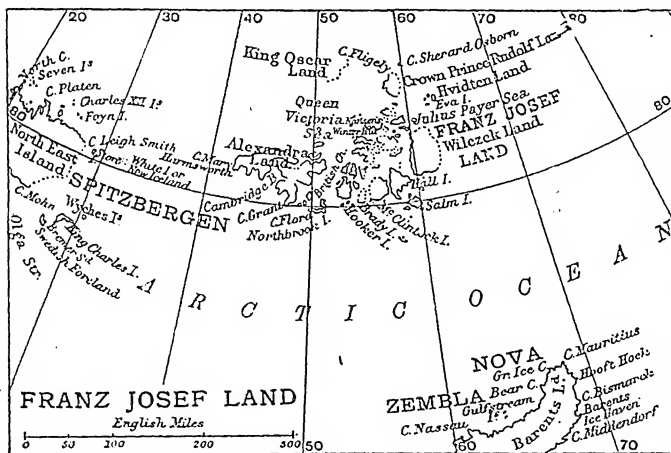
Frapan, ILSE, pseudonym of ILSE LEVIN (1852), German novelist, was born at Hamburg. She has achieved great popularity by her admirable short stories and sketches, which include *Hamburger Novellen* (four series, 1886, 1888, 1890, 1895); *Enge Welt* (1891); *Bittersüss* (1891); *Bekannte Gesichter* (1893); *Zu Wasser und zu Lande* (1894); *Flügel auf!* (1895); *Vom ewig Neuen* (1896); *In der Stille* (1897); *Die Betrogenen* (1898); *Was der Alltag dichtet* (1899); *Wehrlose* (1900); *Arbeit* (1903).

F.R.A.S., Fellow of the Royal Astronomical or of the Royal Asiatic Society.

Frascati, tn., episc. see, and summer resort of Italy, prov. Rome, stands on the Alban Hills, 980 ft. above the sea, and 15 m. by rail S.E. of Rome. It represents the ancient Tusculum, and possesses several handsome villas—e.g. Torlonia (Conti), Aldobrandini, and Ruffinella. It is famous for its gardens and its wine. Pop. (1901) 8,453.

Fraser, riv., British Columbia, formed by the union of the S. Fork and the N. Fork. The S. Fork rises to the N. of Mt. Brown in the Rocky Mts., and flows N.W. for 190 m., when it is joined at Fort George by the N. Fork, which also rises in the Rocky Mts. Thence the river flows S.; but on reaching the town of Hope it takes a bend to the W., and falls, after a course of 750 m., into the Strait of Georgia, which separates Vancouver I. from the mainland. The river is navigable for steamboats as far as Yale (190 miles). Large ships can reach New Westminster. Between Lytton and Yale the river flows through Big Cañon, where the scenery is magnificent. The salmon canneries of the river are exceedingly important. The river is so called from Simon Fraser, who explored it in 1808. Area of basin, 138,000 sq. m.

Fraser, ALEXANDER CAMPBELL (1819), Scottish philosopher, born at Ardchattan, Argyllshire; was appointed lecturer on mental philosophy at the New College, Edinburgh (1846). In 1856 he succeeded Sir W. Hamilton in the chair of logic and metaphysics



professor of history there. On the cession of Finland to Russia he migrated to Sweden, and became bishop of Hernösand (1831). From 1808 he was a member of the Swedish Academy. His fresh, natural verse, with its naïve idyllic charm, expressed in the most exquisite language, shows great originality. An edition of his collected poems, in 10 vols., was issued in Stockholm between 1867 and 1889.

Franzensbad, wat.-pl., Bohemia, Austria, stands amongst the spurs of the Erzgebirge and the Fichtelgebirge, 4 m. by rail N. of Eger. It is much resorted to for its chalybeate and saline springs, impregnated with carbon dioxide. Pop. (1900) 2,330.

Franzensieste, fortress, Tyrol, Austria, 9 m. N. of Brixen. It commands the railways running through the Brenner Pass to Innsbruck, and through the Puster valley to Klagenfurt.

pelago. Wellman was in Franz Josef Land in 1899; the Duke of the Abruzzi and Prince Amadeus of Savoy explored in this region in 1899-1900; and the Ziegler expedition (1903-5) went north by the Franz Josef route. See Jackson's *A Thousand Days in the Arctic* (1899); Payer's *New Lands within the Arctic Circle* (1876). Leigh Smith's two voyages are described by Sir Clements Markham (*Proc. Roy. Geog. Soc.*, iii.), and Nansen's observations are recorded in vol. ii. of his *Farthest North* (1897).

Franzos, KARL EMIL (1848-1904), novelist, born in Podolia, Russia, the son of a Jewish doctor. From 1877-82 and from 1884-87 he lived in Vienna, in 1883 and after 1887 in Berlin, where he edited the review *Deutsche Dichtung*. He wrote numerous novels, in many of which he depicts with great power and brilliant colouring the varied types of men in

in Edinburgh University, from which he retired in 1891. He edited the *North British Review* from 1850 to 1857, and delivered the Gifford lectures (1894-6). His editions of Locke (1894) and Berkeley (1871; new ed. 1901) are standard works; and he has also published *Essays in Philosophy* (1846-56), *Rational Philosophy* (1858), *Philosophy of Theism* (1896), *Reid* (Famous Scots Series, 1898), and *Biographia Philosophica* (1904).

FRASER, JAMES (1818-85), bishop of Manchester, born at Prestbury, Gloucestershire. Taking orders in 1846, he held the livings of Cholderton, Wiltshire, and Upton Nervet, Berkshire. After drawing up a report on the educational conditions in thirteen English parishes (1859), he received a commission to report on Canadian and American education (1865). In 1870 he was presented to the see of Manchester. See *Lives* by Thomas Hughes (1887) and Diggle (1889).

FRASER, SIMON, LORD LOVAT. See LOVAT.

FRASER, SIR THOMAS RICHARD (1841), physician and scientist, was born in Calcutta. In 1877 he accepted the professorship of materia medica in the University of Edinburgh. In 1878 he became also professor of clinical medicine, and from 1880 to 1900 was dean of the faculty of medicine, and president of the Indian Plague Commission (1898-1901). Professor Fraser has made important studies on serpents' venom, published in the *Trans.* of the Royal Societies of London and Edinburgh, etc.

FRASER, SIR WILLIAM (1816-98), Scottish genealogist and antiquary, was born in Kincardineshire. He was appointed assistant-keeper of the Edinburgh Register House in 1852, but exchanged the post in 1880 for that of deputy-keeper of the records, which he held until 1892. He compiled a number of valuable genealogies of ancient Scottish families. Among them are those of the *Stirlings of Keir* (1858), the *Earls of Eglinton* (2 vols. 1859), the *Earls of Cromartie* (2 vols. 1876), the *Chiefs of Grant* (3 vols. 1883), the *Chiefs of Colquhoun* (2 vols. 1869), and the *Earls of Haddington* (2 vols. 1889). He left a large legacy to the University of Edinburgh, endowing a chair of ancient history and paleography; another sum was destined for the foundation of the homes for decayed artists and men of letters at Colinton, near Edinburgh. He served on the Royal Commission on Historical MSS. from 1869.

FRASERBURGH, dist. and tn., Cape Colony, 270 m. N.E. of Cape Town. The district consists of

typical karroo country. Pop. (1904) of dist. 6,466; of tn. 2,000.

FRASERBURGH, par., fishing tn., and seapt., Aberdeenshire, Scotland, on S. slope of Kinnaird's Head, 47 m. N.E. of Aberdeen. The harbour was much enlarged in 1898. Fraserburgh is the chief centre of the Scottish herring fishery. The town was formerly called Faithlie or Philorth. Pop. (1901) 9,105.

FRASERVILLE, or RIVIÈRE DU LOUP EN BAS, vil. and wat.-pl., Quebec, Canada, on r. bk. of St. Lawrence, opposite Hare I., 127 m. N.E. of Quebec; has mills and tanneries. Pop. (1901) 4,569.

FRATERCULA. See PUFFIN.

FRATICELLI, FRATRIGELLI, or FRÉROTTS (a contemptuous diminutive), was a name given to certain of the more rigorous branches of the Franciscan order. In 1323 Pope John XXII. denounced them as heretics, but in 1329 most of them submitted to papal authority.

FRATTAMAGGIORE, tn., Italy, prov. Naples, 8 m. by rail N. of Naples, of which it is a residential suburb. Pop. (1901) 13,323.

FRAUD. Fraud consists in making a false representation of an existing fact knowingly, or without belief in its truth, or recklessly, without caring whether it be true or false. A false statement made through mere carelessness, and without reasonable grounds for believing it to be true, may be evidence of fraud, but does not necessarily amount to fraud. Where a person has been actually deceived, and has been induced to enter into a contract by the fraud of another, the contract is not void, but voidable. He may, if so minded, abide by the contract, and, speaking generally, sue for any damage he may have suffered as a consequence of the fraud; or he may have the contract rescinded; or he may bring an action, *ex delicto*, for fraud, and recover damages. Fraud must be distinguished from misrepresentation, which is a misstatement. A mere non-disclosure of a material fact does not, as a rule, amount to fraud, nor does it give any cause of action in respect of it; but in the case of contracts *uberrimæ fidei*, such as contracts of insurance, family settlements, sales of land, or the allotment of shares in public companies, non-disclosure of a material fact will entitle the person deceived to rescind the contract. A judgment may always be set aside on the ground of fraud; and even a marriage may be annulled if the defrauded party did not understand the nature of the ceremony. Whoever by any false pretence—i.e. by a false statement as to an existing fact—obtains from any other person any chattel, money,

or valuable security, with intent to defraud, commits a misdemeanour punishable by five years' penal servitude. It is not necessary that the false pretence should be made by words or writing; any act which is intended to, and does, deceive will be sufficient—e.g. giving a cheque, knowing it will not be honoured. Cheating is a kind of fraud, and consists in perpetrating a fraud by means of a trick or ingenious device. Cheating at cards is punishable in like manner as obtaining money by false pretences (8 and 9 Vict. c. 109, s. 17).

FRAUDS, STATUTE OF, 1677. This statute, which does not apply to Scotland, requires certain documents to be in writing. As to contracts, see CONTRACT. All leases, except leases for less than three years at two-thirds of the improved value, or any uncertain interest in freeholds or terms of years, must be in writing, otherwise a tenancy at will is created. Assignments and surrenders of leases, declarations of trusts of land, and assignments thereof, must be in writing. By Lord Tenterden's Act, 1828, an acknowledgment of a debt, which would otherwise become statute-barred, and a guarantee of character, must be in writing.

FRAUENFELD, chief tn., Swiss canton of Thurgau, 26 m. by rail N.E. of Zürich, with textile and machinery industries. Pop. (1901) 7,761.

FRAUENLOB. See HEINRICH VON MEISSEN.

FRAUNHOFER, JOSEPH VON (1787-1826), German optician, born at Straubing in Bavaria. He produced a machine for polishing spherical lenses to a mathematically uniform surface for telescopic use. In 1809, in conjunction with Reichenbach and Utzschneider, he founded an optical institute at Benedictbeuern, near Munich, of which he later became sole manager. Fraunhofer is remembered for the manufacture of complicated lenses for use in telescopes and microscopes, and by his independent discovery of the dark lines in the solar spectrum named after him. His collected works appeared at Munich (1888). See *Astronomische Nachrichten* (vol. v. 1825), article by Utzschneider, and his *Kurzer Umriss der Lebensgeschichte... von Fraunhofer* (1826), and *Lives* by Merz (1865) and Voit (1887).

Fraunhofer Lines, dark lines in the solar spectrum, partially observed by Wollaston in 1802, and mapped in 1814 by Joseph Fraunhofer. He counted 600 of these hairlike streaks, and measured the positions in the spectrum of 324, affixing to a few of the more conspicuous letters of the alpha-

bet (A to H), by which they are still distinguished. Their meaning remained mysterious until the discovery, by Kirchhoff and Bunsen, in 1859, of the principles of spectrum analysis. (See SPECTRUM and SPECTROSCOPE.) Their interpretation has made us cognizant of the solar existence of about forty terrestrial elements, forming a 'reversing layer,' through which the photospheric radiance is sifted, and stamped with characteristic absorption. Dark lines thus show where beams have been subtracted by selective action; but their linear shape is simply due to the fact that they are images of a rectangular slit, employed to 'purify' the spectrum, which would otherwise be rendered featureless by the overlapping of rays from all parts of the light-source. The best modern maps of the solar spectrum, executed photographically by the late Henry Rowland of Baltimore, U.S.A., include more than 10,000 Fraunhofer lines.

Fraustadt, tn., prov. Posen, Prussia, 14 m. N.E. of Glogau; has tanneries, sugar factories, and dyeworks. In 1706 it was the scene of the defeat of the Saxons and Russians by the Swedes under Charles XII. Pop. (1900) 7,462.

Fraxinus. See **ASH**.

Fray Bentos. See **INDEPENDENCIA**.

Frazer Island, or **GREAT SANDY ISLAND**, isl., Queensland, Australia, between Wide Bay and Hervey Bay; is about 65 m. long by 10 m. wide.

Frazer, James George (1854) Scottish writer on mythology, born at Glasgow. Elected a fellow of Trinity College, Cambridge (1879), he has devoted himself to studies in comparative religion. His chief work—one of the ablest on comparative mythology—is *The Golden Bough* (1890; 2nd ed. 1900). Besides this, he has published a revised edition of Long's *Sallust* (1884), *Totemism* (1887), *Pausanias* (1900), and *Lectures on Early Kingship* (1905).

F.R.C.I., Fellow of the Royal Colonial Institute.

F.R.C.P., Fellow of the Royal College of Physicians.

F.R.C.S., Fellow of the Royal College of Surgeons.

Fréchette, Louis Honoré (1839), French-Canadian poet, native of Point Lévis, Quebec. Among his poetical works are *Mes Loisirs* (1863); *La Voix d'un Exilé* (1869); *Pêle-Mêle* (1877); *Les Oiseaux de Neige* (1880); *La Légende d'un Peuple* (1887); *Les Feuilles Volantes* (1891); and *Véronica*, a drama. He is generally regarded as the chief poet of French-Canadian life. His prose works include *Lettres à Basile* (1872); *Lettres sur l'Éducation*

(1893); and *Christmas in French Canada* (1899).

Freckles, small scattered pigmentations of the skin, appearing almost always on the hands, face, and neck. They are due to the action of the sun's rays. With peeling of the skin—i.e. of the superficial epidermis—the freckles disappear.

Fredegond, or **FREDEGUNDE** (?545-597), mistress and afterwards wife of Chilperic, king of Neustria. After separating Chilperic from his first wife Andovera, Fredegond is believed to have compassed the death of his second, Galsvintha, and then became his wife. She was involved in a bitter feud with Sigibert, king of Austrasia, and his wife Brunhilda, sister of Galsvintha. After instigating the murder of Sigibert, and removing all whose lives obstructed the succession of her son, afterwards Clotaire II., she carried on a successful campaign against Brunhilda and her grandsons. See **BRUNHILDA**.

Frederic, Harold (1856-98), American novelist and journalist, was born in Utica, New York; after gaining journalistic experience in America, went to London, and acted as correspondent to the *New York Times* from 1884 until his death. His novels, for which he became widely known, include *Seth's Brother's Wife* (1887); *The Lawton Girl* (1890); *In the Valley* (1890); *The Copperhead* (1894); and *The Damnation of Theron Ware* (1896), his masterpiece. All these, dealing mainly with life in New York state, contain fine character-drawing—a power which, with Frederic's abounding humour, creates the charm of *Marsena* (1895).

Fredericia, tn., S.E. Jutland, Denmark, on the Little Belt. It is the junction of the Jutland railways, and has steamboat communication with Fünen. The fortress was stormed by the Swedes in 1657. Here the Danes defeated the Schleswig-Holsteiners in July 1849. Pop. (1901) 12,714.

Frederick, city, Maryland, U.S.A., the co. seat of Frederick co., 40 m. N.W. of Washington. Pop. (1900) 9,296.

Frederick I. (1123-90), Holy Roman emperor, the first of the Hohenstaufen dynasty, known as 'Barbarossa,' was the son of Frederick, Duke of Swabia, and succeeded Conrad III. as emperor in 1152. For two years he busied himself in the settlement of German Thataccomplished, he paid his first visit to Italy, received the Lombard crown at Pavia, and (June 18, 1155) was crowned emperor in Rome by Adrian IV., and executed Arnold of Brescia, the founder of the Roman commune. The year 1157 witnessed the beginning of Frederick's quar-

rel with the papacy. In 1158 the emperor crossed the Alps, compelled Milan to submit, and held a triumphant diet at Roncaglia. Revolts followed, and Milan sustained a siege of three years, which closed with its capture and destruction. In 1168 the Lombard League, an outcome of the enmity of the North Italian cities to the emperor, took final shape, and the town of Alessandria was built as a defence against German armies; and in 1176 the league was victorious over Frederick in the battle of Legnano. Pope Alexander III., by the peace of Venice (1177), forced his opponent to make full submission. Frederick was reconciled with the papacy, and in 1183 the peace of Constance closed the struggle with the Lombard League. During the years succeeding the peace of Venice Frederick broke the power of Henry the Lion, Duke of Saxony (1181), and divided the duchy; and in 1183, by the treaty of Augsburg, he arranged a marriage between his son Henry and Constance, daughter of Roger, king of Sicily. From this marriage sprang the union of Sicily with the empire. At the same time, owing to internal divisions, the Lombard League weakened, and Frederick's power in Italy revived. Being practically master of Germany and Italy, Frederick put himself at the head of the third crusade, but perished in a small stream in Cilicia. See Prutz's *Kaiser Friedrich I.* (1871-3); Raumer's *Geschichte d. Hohenstaufen* (ed. 1878); Testa's *Hist. of the War of Frederick I. against the Communes of Lombardy* (1877); and Tout's *The Empire and the Papacy* (1903).

Frederick II. (1194-1250), Holy Roman emperor, the son of the Emperor Henry VI. and of Constance, heiress of Sicily, was born at Jesi, near Ancona, in Italy. On the death of his father (1197), Frederick's succession in Naples and Sicily was secured by Constance; but it was not till 1212 that Otto IV. having been excommunicated, Frederick was elected emperor. Brought up in Sicily, he had been affected by the half-Greek, half-Arabic civilization of that island. He was versed in geometry, astrology, and natural history; he knew many languages, and was interested in many literatures. He loved sport and exercise, but at the same time was a valetudinarian, and studied medicine and surgery. He cared little for war, but delighted in diplomacy. Accusations were often made against his orthodoxy, and he was accused of scepticism. In 1226 Frederick renewed the ancient imperial claims over

Lombardy. Pope Honorius III. prepared to support the Lombard cities, and his successor, Gregory IX. (1227-41), began the celebrated struggle between the papacy and the emperor. In 1228 Frederick entered upon a crusade, and was crowned king at Jerusalem. During his absence Gregory devastated Apulia; but in 1230 a peace was patched up between pope and emperor at San Germano. In the ensuing struggle with the papacy, Frederick neglected his duties in Germany, and devoted all his energies to establishing in his Sicilian kingdom 'a centralized bureaucracy, dependent upon himself.' Aided by the Lombard cities and by many German nobles, the papacy eventually won the day. See Kington's *History of Frederick II.* (1862); Schirrmacher's *Kaiser Friedrich II.* (1859-65); Winkelmann's *Kaiser Friedrich II.*, in *Jahrb. d. Deut. Gesch.* (1889-97); Raumer's *Gesch. d. Hohenstaufen* (ed. 1878); and Tout's *The Empire and the Papacy* (1903).

Frederick III. (1415-93), Holy Roman emperor, was born at Innsbruck, in Tyrol, being a member of the house of Hapsburg. He was chosen emperor in 1440. Though without energy and decision, Frederick was patient, fond of peace, and by no means incompetent. But his reign covered a difficult period, during which the Turks invaded Hungary and Italy, and the Hungarians occupied Vienna. He was unable to prevent George Podiebrad from seizing Bohemia, or Matthias Corvinus from possessing himself of Hungary. Switzerland escaped from his control, and Sforza took Milan. But he duped Charles the Bold, who wished to secure the royal title; he defeated the schemes of his opponents in Germany; and he gradually reunited the family territories of the Hapsburgs. From this time, indeed, the imperial dignity was almost hereditary in the house of Austria (Hapsburg). The marriage, too, of his son Maximilian with Mary of Burgundy was destined to render the Hapsburgs one of the greatest dynasties in Europe. See Chmél's *Geschichte Kaiser Friedrichs IV. (III.)* (1840-3).

Frederick I. (1309-1428), elector of Saxony, was born at Altenburg, being the son of Frederick, margrave of Meissen; became on his father's death, in 1381, involved in disputes with his two brothers, with the result that the family territory was divided. He fought against the Lithuanians, the Hungarians, the Emperor Wenceslaus, and the Hussites. At first he was successful against the last named, and, as a reward for his efforts,

the Emperor Sigismund made (1424) him elector and duke of Saxony. In 1426, however, he was disastrously defeated by the Hussites at Aussig.

Frederick III. (1463-1525), called 'the Wise,' elector and duke of Saxony, was born at Torgau, and succeeded his father in 1486. Wielding immense influence in German politics in the early years of the 16th century, Frederick of Saxony was a man of strong religious opinions. On the death of Maximilian I. in 1519, he was offered the imperial crown. He, however, threw all his influence on the side of Charles of Spain, who became emperor as Charles V. He had already, in 1502, founded the University of Wittenberg, and had appointed Luther and Melancthon to two of the professorial chairs. After Luther's return from the Diet of Worms, Frederick took the reformer under his personal protection, though he never formally adopted the Protestant tenets.

Frederick I. (1657-1713), king of Prussia, succeeded his father, the 'great elector' of Brandenburg, in 1688. He warmly supported the League of Augsburg in its opposition to Louis XIV. and aided William III. in carrying out the revolution of 1688 in England. In order to secure Frederick's adhesion to the Austrian cause in the war of the Spanish Succession, the Emperor Leopold gave him the title of king of Prussia (1701). He was the founder of the University of Halle (1694); he in many ways improved Berlin; he added several small territories to Prussia, and was elected prince of Neuchâtel (1707). See Ledebur's *König Friedrich I. von Preussen* (1878-84).

Frederick II. (1712-86), king of Prussia, called 'the Great,' was born in Berlin; succeeded his father, Frederick William I., in 1740. In October 1740, on the death of the Emperor Charles VI., whose dominions passed to his daughter, Maria Theresa, Frederick revived an obsolete claim to part of Silesia, invaded the province, and defeated the Austrian army at Mollwitz (April 10, 1741) and Chotusitz (May 17, 1742). Maria Theresa surrendered almost the whole of Silesia by the treaty of Breslau (June 11, 1742). Austria, however, gained such conspicuous successes in the next two years that Frederick renewed his alliance with France, and re-entered the war in August 1744 by invading Bohemia. His intervention forced the Austrian army to evacuate Alsace, but Frederick himself was driven from Bohemia, and in the next year was compelled to resist an invasion of Silesia. This he succeeded in doing by a great victory at Hohen-

friedberg (June 5, 1745); and following the Austrians to Bohemia, he again defeated them, at Sohr (September 20). Finally, by a successful attack upon Saxony, the ally of Austria, he compelled Maria Theresa to renew the cession of Silesia by the treaty of Dresden (December 25).

In 1756, when Austria found allies in France and Russia, Frederick threw down the glove by invading Saxony, and thus commenced the famous Seven Years' war. His forces were decimated in fearful battles like Kolin, Rossbach, Leuthen, Zorndorf, Hochkirch, and Kunersdorf, and victory was almost as disastrous as defeat. More than once Frederick thought of suicide as the only escape from the evils he had brought upon his kingdom. But when the outlook was almost hopeless he was saved by the death of Elizabeth of Russia, and by the exhaustion of France. Austria alone was powerless to overcome Frederick, and the treaty of Hubertsburg in 1763 allowed the Prussian king to retain his dominions intact. During the years of peace that followed, Frederick devoted himself to the work of domestic government. His greatest achievement in this period was the dexterous if unprincipled management of the first partition of Poland (1772), by which he acquired West Prussia. Almost equally noteworthy was his successful resistance to the ambitious designs of Joseph II. to add Bavaria to the Austrian dominions. See Carlyle's *Hist. of Frederick II.* (1858-65); Koser's *Friedrich der Grosse* (1900-3); Droysen's *Friedrich der Grosse* (1874-85); Kugler's *Hist. of Frederick the Great* (Eng. trans. 1877); and Reddaway's *Frederick the Great* (1904).

Frederick III. (1831-88), German emperor, was born at Potsdam, the only son of Emperor William I., and the husband of Victoria, Princess Royal of England, whom he married in 1858. As soon as he became crown prince (1860) he took up an independent line in political matters, and opposed Bismarck's policy on various occasions. In the war with Austria (1866), the crown prince commanded the second army of 115,000 men, which arrived at Sadowa just in time to turn the scale decisively against the Austrians. In the Franco-German war of 1870-1, the crown prince on Aug. 6, 1870, attacked and defeated MacMahon's army at Wörth, and on the 11th he crossed the Vosges. In 1878, during the illness of the Emperor William, he acted as provisional regent; and on the death of his father, in March 1888, he became emperor as Frederick

III., but four months later died from a disease of the throat. See *Lives* by Rennel Rodd (1888) and Gustav Freytag (1890).

Frederick V. (1596-1632), Elector Palatine, was the leader of the Calvinist party in Germany. He succeeded his father in 1610, and married Elizabeth, daughter of James I. of England, in 1613. When, in 1618, the Bohemians deposed the Emperor Ferdinand II., and chose Frederick as their king, a struggle began in Bohemia. Driven from Bohemia after his defeat at Prague (1620), Frederick found that the Palatinate was overrun by the Imperialists, and given to Maximilian of Bavaria, who received the title of elector. For the rest of his life Frederick was an exile.

Frederick, eight kings of Denmark, of whom the following deserve notice. **FREDERICK III.** (1609-70), second son of Christian IV., succeeded his father in 1648; engaged in two ruinous wars with Sweden (1658), which cost Denmark all her possessions in the Scandinavian peninsula. The turbulence and obstructiveness of the nobility hampered Frederick's well-meant efforts to improve the condition of his people, till the two lower estates of the Copenhagen Rigsdag conferred upon him absolute sovereignty, as being the only means of saving the state (1660).—**FREDERICK IV.** (1671-1730), son of Christian V., whom he succeeded in 1699. During the earlier part of his reign he waged an intermittent war with Sweden, but relinquished all his acquisitions by the peace of Frederiksborg (July 3, 1720), in exchange for 600,000 thalers. He rebuilt Copenhagen, and relieved the wretched condition of the peasantry.—**FREDERICK V.** (1723-66), son of Christian VI., whom he succeeded in 1746. An enlightened despot, largely guided by the great minister, J. H. E. von Bernstorff.—**FREDERICK VI.** (1768-1839), son of the imbecile Christian VII., whom he succeeded in 1808, after acting as prince regent from 1784. His participation in the Napoleonic wars led to the bombardment of Copenhagen by the British (1807), the capture of the Danish fleet, and ultimately the loss of Norway.—**FREDERICK VII.** (1808-63), son of Christian VIII., whom he succeeded in 1848. He restored parliamentary government in Denmark (June 5, 1849), but dealt tyrannously with the Schleswig-Holstein duchies.—**FREDERICK VIII.** (1843), son of Christian IX., succeeded his father in 1906. In 1869 he married Louisa, only daughter of Charles XV. of Sweden.

Frederick I. (1754-1816), king of Württemberg, was born at Trep-

tow, in Pomerania, and succeeded his father in 1797. Having declared war against France, he saw his country invaded, and was forced (1801) to exchange Montbéliard and his possessions in Alsace for nine imperial towns and other territories, and was given by Napoleon the title of elector. In 1805, on the outbreak of war between France and Austria, Frederick fought for the French, and was rewarded at the treaty of Pressburg by some Austrian lands in Swabia, together with the title of king. By joining the Confederation of the Rhine, the new king obtained fresh territories. After Napoleon's overthrow at Leipzig (1813) Frederick joined the allies.

Frederick (1676-1751), king of Sweden, born at Kassel, third son of the landgrave Karl of Hesse-Kassel; entered the English military service, and commanded the Hessian corps in the war of the Spanish Succession. He married Ulrica Leonora, sister of Charles XII. (1715), and entered the Swedish service, and on the resignation of his consort (April 4, 1720) became king of Sweden. His reign was distracted by the struggles of the Hats and the Caps parties.

Frederick Charles of Prussia (1828-85), nephew of the Emperor William I., born at Berlin, was known as the 'Red Prince.' Served in the Schleswig-Holstein war (1848); in the Austrian war of 1866 he helped to win the battle of Sadowa; and in the Franco-German war of 1870-1 he gained distinction at Thionville, Gravelotte, and St. Privat. He also drove Bazaine into Metz, which he invested; and after its capitulation he took Orleans and dispersed the army of the Loire.

Frederick Louis (1707-51), Prince of Wales, the eldest son of George II.; created Prince of Wales (1729). Frederick lived on bad terms with his father. The opposition to Walpole found Norfolk House, the prince's residence, a useful centre; and round Frederick, in 1737, gathered Bolingbroke's followers.

Frederick William (1620-88), elector of Brandenburg, known as the 'Great Elector,' was born at Köln, on the Spree, and succeeded his father in 1640. By the treaty of Westphalia (1648) he received Magdeburg, Halberstadt, Kammin, and Minden. Taking advantage of a war between Sweden and Poland, he secured the independence of Prussia from Poland by the treaties of Wehlau (1657) and Oliva (1660); and when Louis XIV. entered upon his Dutch war (1672-8), Frederick William made a league against the French king, and by the battle of Fehrbellin

(1675) he cleared Western Pomerania of the Swedes. He was, however, by the treaty of St. Germain-en-Laye (1679), compelled to reinstate Sweden in Pomerania. His internal reforms were equally noteworthy. Agriculture was encouraged, a canal made between the Elbe and the Oder, and after the revocation of the Edict of Nantes (1685) over 20,000 Huguenots found a home in Brandenburg. Between 1679 and 1688 the aggressions of Louis XIV. led the Great Elector to take up an attitude of firm opposition to the policy of the French king. See Philippson's *Der Grosse Kurfürst* (3 vols. 1897-1903).

Frederick William I. (1688-1740), king of Prussia, was born at Berlin, son of Frederick I., whom he succeeded in 1713. From the war with Sweden, in which he found himself engaged, he in 1720 gained the district of Pomerania between the Oder and the Peene, including Stettin and the islands of Wollin and Usedom. Henceforward he set himself to create an administrative system, to organize a powerful army, and to secure the duchies of Juliers (Jülich) and Berg. He encouraged agriculture, introduced into E. Prussia some 17,000 Protestant refugees from Salzburg, and reformed the finances. In the Polish Succession war a Prussian contingent aided the Austrians. See Paulig's *Friedrich Wilhelm I.* (2nd ed. 1889).

Frederick William II. (1744-97), king of Prussia, was the nephew of Frederick the Great, whom he succeeded in 1785. Shortly after his accession he invaded Holland in order to help his sister, the Princess of Orange; and in 1788 the Triple Alliance between England, Prussia, and Holland was formed. Frederick William, however, was with difficulty induced not to attack Austria, then at war with Turkey; and in 1790 he made the Convention of Reichenbach with the Emperor Leopold. In 1792 Prussia and Austria entered upon a war with the French republic; but anxiety to take part in the partitions of Poland (1793 and 1795) and jealousy of Austria weakened the Prussian efforts. In September 1792 the French won the battle of Valmy; and in 1795, by the treaty of Basel, Prussia became neutral. Frederick William was extravagant, under the influence of mystics, and was intolerant. By the partitions of Poland large areas were added to Prussia. See Paulig's *Friedrich Wilhelm II.* (1896).

Frederick William III. (1770-1840), king of Prussia, son of Frederick William II., whom he succeeded in 1797. In 1806 he was overthrown by Napoleon in

the battles of Jena and Auerstädt. The treaty of Tilsit (1807) completed the ruin of Prussia, which, despoiled of all its territories west of the Elbe, remained till 1813 dependent upon Napoleon. Civil and military reforms were, however, initiated by Stein, Hardenberg, Scharnhorst, and Gneisenau, and in 1813 Prussia definitely joined Russia in the war of liberation. Though defeated at Lützen and Bautzen (May 1813), the allies, reinforced by Austria, overthrew Napoleon at Leipzig (October 1813). At the Congress of Vienna Prussia regained her lost territory, with sundry additions. Frederick William then joined the Holy Alliance; and though the *Zollverein* or customs union was established and many reforms inaugurated, he suppressed the liberal movements of 1823 and 1830, and checked the freedom of the press. See Hahn's *Friedrich Wilhelm III. und Luise* (3rd ed. 1877).

Frederick William IV. (1795-1861), king of Prussia, succeeded his father Frederick William III. in 1840. A talented man, disliking the bureaucratic government of Prussia, he, in 1845, formed constitutional schemes, and in 1847 summoned the 'United Diet' of Prussia. In 1848 the revolution broke out in Berlin, and the king posed as a German nationalist; but the excesses of the democrats irritated him, Berlin was overawed by troops, and by the end of the year Prussia was again a military monarchy. Frederick William then refused the imperial crown, and devised a new constitution for Germany. He received little support, and the convention of Olmütz (1850) proved a victory for Austrian diplomacy. In 1857 the king became insane, and resigned the government to his brother William. See Ranke's *Biographie Fr. Wilhelms IV.* (1878), and Petersdorff's *König Fr. Wilhelm IV.* (1900).

Fredericksburg, city, Virginia, U.S.A., on the Rappahannock R., about 55 m. N. of Richmond. Here in 1862 the Union troops were defeated by the Confederates. Pop. (1900) 5,068.

Fredericton, cap. of New Brunswick, Canada, on the St. John R., and at the head of the permanent navigation, 84 m. from the sea. It is the terminus of the Fredericton and New Brunswick railroads, and is the seat of the University of New Brunswick and of an Anglican bishopric. It has a large lumber trade. Pop. (1901) 7,117.

Frederiksberg, a suburban municipality of Copenhagen, Denmark, mainly residential. A military college is housed in the Frederiksberg palace. Pop. (1901) 76,231.

Frederiksborg, a royal castle and (since 1878) historical museum, 20 m. by rail from Copenhagen, Denmark. Built in 1602-20, it was almost destroyed by fire in 1859, but was rebuilt (1864-71).

Frederikshald, tn. and seapt., co. Smaalenene, 60 m. S.S.E. of Christiania, Norway. It exports timber, fish, and granite. Under its walls Charles XII. of Sweden was killed in 1718. Pop. (1900) 11,936.

Frederikshavn, formerly FLADSTRAND, seapt. tn., Denmark, on the Kattegat, 36 m. N.E. of Aalborg, with the second best harbour on the E. coast of Jutland. Until 1818 it was only a fishing village. Pop. (1901) 6,538.

Frederikstad, seapt. tn., co. Smaalenene, S. Norway, 50 m. S. of Christiania, at the mouth of the Glommen. It exports timber, stone, and bricks, and manufactures bricks, tiles, and nails, and has railway works and shipbuilding. Pop. (1900) 14,573.

Fredonia, tn., Antioquia, Colombia, S. America, with coal mines. Pop. 11,000.

Freebench is the life estate which a widow enjoys in some part, generally a third, of her late husband's copyholds. It is unaffected by the Dower Act, 1834. See also HUSBAND AND WIFE.

Free Church of England, an Episcopal organization founded 1844, an outcome of the Oxford Tractarian movement. Its promoters sought to secure evangelical services on strictly Protestant lines, wherever needed, without alliance with the state. The first church planted was at Bridgetown, Devon, by the Rev. J. Shore. Its bishops have maintained consecration in the Canterbury line through the early American Episcopal church. A yearly convocation is held.

Free Church of Scotland, a body of Christians in Scotland dating from the 'Disruption' of 1843, but which claims real historical and hereditary identity with the National Church of Scotland as reformed in 1560. The struggle within the church was one of exclusive ecclesiastical jurisdiction and non-interference of the state; concretely it was over the question of patronage and the freedom of congregations to reject presentees to a living. In 1834 the Veto Act was passed by the General Assembly, in which it was declared that no pastor should be intruded on a congregation contrary to the will of the people, and the 'Ten Years' Conflict' within the church over this question began. The decision of the Court of Session in the Auchterarder case (1838) was against the church and against

the right to reject a presentee, and this decision was confirmed by the House of Lords (1839). After an appeal to the queen (1842) against the encroachments of the Court of Session, and also an address praying for the abolition of patronage, both of which were without avail, a final appeal was made to Parliament in March 1843. The House of Commons, however, by a majority of 135 declined to attempt any redress of the grievance of the Scottish Church. At the first session of the following Assembly (May 18, 1843) the non-intrusion party made a protest, signed by more than 200 commissioners, to the effect that, as recent decisions of the civil courts had made it impossible to hold a free Assembly of the church as by law established, 'we protest that it shall be lawful for us . . . to withdraw to a separate place of meeting for the purpose of taking steps for ourselves and all who adhere to us—maintaining with us the Confession of Faith and the Standards of the Church of Scotland as heretofore understood—for separating in an orderly way from the establishment . . .'. The entire non-intrusion party then withdrew, and marched to Tanfield Hall at Canonmills, where the first Assembly of the Free Church was constituted, with Dr. Thomas Chalmers as moderator. This Assembly sat from 18th to 30th May. On the 23rd May 396 (ultimately 474) ministers and professors signed an act of separation and deed of demission, by which they renounced all claim to the benefices they had held in connection with the establishment, and consenting to their being dealt with as vacant, thereby voluntarily surrendering an annual income of over £100,000. A sustentation fund was immediately formed, by which each congregation helped every other. At the close of the first year the fund exceeded £60,000, and it steadily increased until in 1890 it had reached £188,146, ensuring an equal dividend of £160, exclusive of surplus, to each minister of the church.

In 1863 a committee was appointed to confer with a similar committee of the United Presbyterian Church as to a union of the two bodies; but the points of difference, especially in regard to state endowments—which the Free Church held to be lawful and even expedient in certain circumstances, while the United Presbyterian Church took an opposite view—prevented any incorporation. The desire for union, however, as manifested by increasing majorities in Assemblies culminated in 1900, when, on October 31 of that year, the union of

the two churches took place, the new body taking the name of 'The United Free Church of Scotland.' A small minority of ministers and elders of the Free Church, who did not see their way to enter the union, made legal claim to the entire property of the church as formerly constituted. The matter was referred to the law courts, and was decided in favour of the United Free Church, both in the Outer House and in the Inner House of the Court of Session. On being appealed to the House of Lords, the decision was in favour of the minority (1904). Owing to the enormous interests at stake and the acknowledged inability of the Free Church to wholly carry on the various schemes of the original Free Church, and after ineffectual attempts at arriving at an understanding between the two churches, action was taken in Parliament. A bill was introduced in June 1905, received the royal assent in August, and a royal commission was appointed for the allocation of property between the Free Church and the United Free Church. The Free Church has its stronghold in the Highlands. See UNITED FREE CHURCH.

Free Churches, the name usually applied to all the non-established churches in England and Wales. It therefore embraces all the nonconformist bodies, both those belonging to the 'Free Churches Association' and those that stand aloof. Free churches by their constitution and name are out-and-out voluntaries, regarding the price paid for state connection as altogether too excessive to be tolerated. They therefore claim complete spiritual independence, acknowledge Christ as their only Head, and arrogate power to their supreme church courts not only to change the church's doctrines, but also to authorize union with any other body professing like views. In short, the name 'Free Church' is understood to imply 'freedom' in every shape and form that is in conformity with the great fundamental and essential truths whereon the churches base their existence. See Copland's *Free Churches of Britain and America* (1895); *Report of the Free Church of Scotland Appeals*.

Free Church Federation. The federation of Free Churches in England dates from the year 1892. The most important religious bodies included in the federation are the Congregational, Presbyterian, Methodist, and Baptist Churches, the Free Episcopal Church of England, and the Society of Friends. The main objects of the federation are, to facilitate intercourse and co-oper-

ation among the Evangelical Free Churches, to advocate the New Testament doctrine of the church, and to defend the rights of the associated churches. The bodies represented in the national council have over 9,000 ministers, about 2,000,000 communicants, and nearly 3½ million Sunday scholars. The federation movement has spread to the British colonies and to the United States.

Freedom of a City. See FREEMEN.

Freedom of the Press. See PRESS.

Freedom of the Will. See DETERMINISM.

Freehold. A freehold estate must be in lands or other hereditaments—as, for example, a rent charge—of free as opposed to copyhold tenure, and it must, in respect of duration, be uncertain. It may be in fee simple—i.e. to a man and his heirs—or in fee tail—i.e. to a man and the heirs of his body—or for life, or for the life or lives of another person or persons. A grant to A for life or until he becomes bankrupt confers a freehold, because A may never become bankrupt; but a grant to A for two hundred years, if he should live so long, does not confer a freehold, because the estate must terminate at a certain definite time. A term of years, however long, is not a freehold but a chattel interest in real property. See also ESTATES and TENURE.

Free Imperial City (*Reichsstadt*) was a city, within the territories of the former German empire, which held its rights and privileges direct from the emperor without intermediary. When their privileges were swept away in 1803, there were 14 Rhenish and 37 Swabian free cities. However, Hamburg, Bremen, Lübeck, and Frankfort-on-Main retained their independence till Frankfort was annexed by Prussia in 1866; while the three Hanseatic cities voluntarily entered the German empire at its formation in 1871.

Freeland, bor., Luzerne co., Pennsylvania, U.S.A., 7 m. S.W. of Whitehaven, in anthracite coal district. It has machine shops and lumber mills. Pop. (1900) 5,254.

Free Libraries. See LIBRARIES.

Freeman, EDWARD AUGUSTUS (1823-92), English historian, was born at Harborne in Staffordshire. In 1849 he published a *History of Architecture*, and followed on with a number of works bearing on history and political science. Of these the best known were *The History and Antiquities of St. David's*, in which he was aided by the Rev. W. B. Jones

(1856); *History and Conquests of the Saracens* (1856); *History of Federal Government* (vol. i. 1863); *Old English History* (1863); *History of the Norman Conquest* (1867-79); *History of the Cathedral Church of Wells* (1870); *Historical Essays* (1871-92); *Growth of the English Constitution* (1872); *A General Sketch of European History* (1872); *Subject and Neighbour Lands of Venice* (1881); *Historical Geography of Europe* (1881); *The Reign of William Rufus* (1882); *English Towns and Districts* (1883); *Methods of Historical Study* (1886); *History of Sicily* (1891-4). *The History of the Norman Conquest* is Freeman's greatest work, and with Stubbs and Green he aroused historical interest in the history of England in the period preceding the Norman conquest. In 1884 he succeeded Stubbs as regius professor of modern history in Oxford. See Stephen's *Life and Letters of E. A. Freeman* (1895).

Freeman's Journal, THE, one of the leading newspapers of Ireland, was founded in 1763 by Grant, Braddell, and Tandy. In 1779 the paper passed into the hands of Francis Higgins. For over twenty years (1779-1802) the *Freeman*, under Higgins, was the official organ of Dublin Castle. Higgins bequeathed the *Freeman* to a relative, whose daughter married Henry Grattan the younger; and thus the paper passed to the son of the man who had been most bitterly denounced in its columns. Since that time the *Freeman's Journal* has been the popular organ of the Irish Nationalist cause.

Freemasonry. The peculiar and distinctive legends of the craft are enshrined in the rolls known as 'old charges,' which are of English origin, though also used in Scotland. The oldest preserved date from the end of the 14th century or a trifle later. The 'William Watsonsone Manuscript' (Leeds) probably contains a survival of the oldest text, which is nearly allied to the additional Manuscript 23,198 in the British Museum. There are certain general characteristics common to all these scrolls, some having peculiar readings. They generally narrate the well-known craft legend, based mainly on the Bible and the *Polychronicon* and other old histories.

These curious rolls gradually ceased to be used on the brotherhood declining as an operative institution, though some lodges kept to the old régime, and objected to take part in the new system far on in the 18th century, one of the oldest and latest to keep aloof being the Melrose

Lodge, with records from 1674, which did not join the Grand Lodge of Scotland until 1891. Some never were absorbed, as the lodge at Alnwick, Northumberland, whose preserved minutes commence in 1701-3, and run on for over fifty years.

In Scotland the nomination of deacons for each craft, as enjoined by Parliament, 1424, with

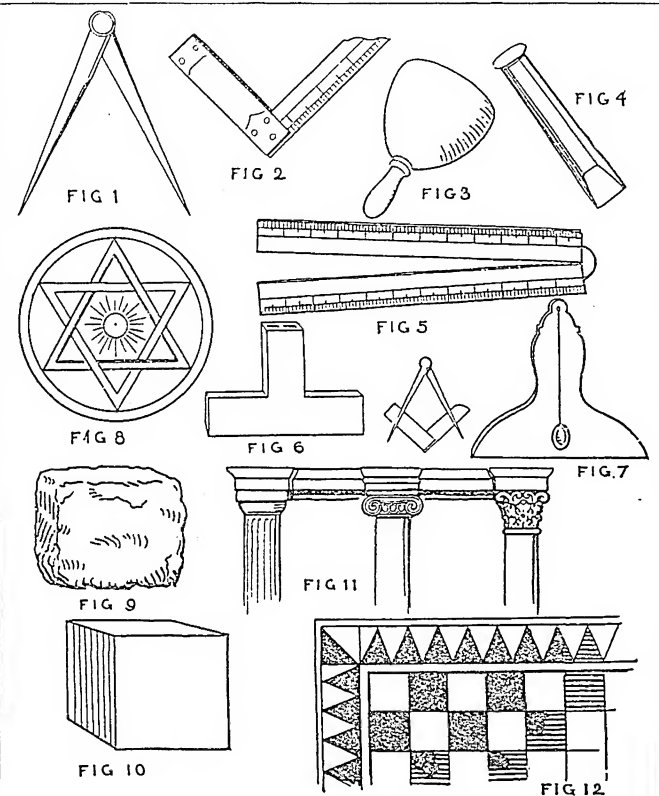
appointment was held by the St. Clairs of Roslin, who are credited in the senior charter of 1601-2 to have 'ever bene patrones and p'tectors of us, decones, mais-teris, and frie men of the mais-sones wthin the realme of Scot-land.' The junior document con-firms the first named (which was signed by William Schaw, master of work to the king), the hammer-

instances 'wrights and square-men.' These letters of jurisdic-tion gave rise to the fiction of the office of grand master being hereditary in the barons of Ros-lin; but they only refer to honor-ary duties as patrons and judges, the office of grand master being unknown until the 18th cen-tury.

There were three head lodges—those of Edinburgh, Kilwin-ning, and Stirling—the relative position of the trio being offi-cially fixed by the lord warden general. That of the Lodge of Edinburgh was the senior of Scotland, as it still is, and so throughout the world, though 'Mother Lodge Kilwinning' has yet many who believe in its greater antiquity, as it has been placed at the head of the Scottish roll, due, however, to good fortune rather than actual evidence. The preserved minutes of the Lodge of Edinburgh commence in 1599, whereas the existing Kilwinning records do not begin until 1642. There are several other Scottish lodges which can boast of transactions dating from the latter century.

The first minute of the Lodge of Edinburgh (Mary's Chapel) concerns an infraction of the regulation against the employ-ment of cowans (1599), another in the following year being the earliest instance known of a non-operative mason being present at a lodge as a member—viz. the laird of Auchinleck (John Bos-well), who attended and attested the minutes by signing his name and mark.

Even more remarkable proof of speculative ascendancy has been discovered of late years in the oldest minutes of the Masons' Company, London (formed about 1400, and arms granted in 1472). Its historian has established the fact that a non-operative lodge assembled under the wing of that company, the meetings of which were known as the 'acceptation,' so far back as 1620-1, in which year the preserved records begin. In 1631 mention is made of 'ma-sons that were to be accepted,' thus leading to the use of the title 'accepted masons.' This is the lodge that Ashmole visited in 1682, and was the senior fellow present. It appears that these initiations qualified for admission into the company those who possessed no claim to the freedom by reason of servitude or patrimony. Nine of the company were present at the lodge in 1682 with Ashmole, the master being one of the number; and of the six admitted, four were on the roll of the com-pany, so that 'acceptations' took place both before and after such membership.



Masonic Symbols and their Meanings.

The gavel (Fig. 3) and chisel (Fig. 4) symbolize the efficacy of work; the 24-inch gauge (Fig. 5), the twenty-four hours of the day, each to have its proper employment; the square (Fig. 2), moral-ity of conduct; the compass (Fig. 1), suggesting the circle, symbolizes the heavenly and spiritual, the square and compass combined expressing the union of matter and spirit; the level (Fig. 6) and the plumb (Fig. 7) represent equality and uprightness; the rough ashlar (Fig. 9) and the perfect ashlar (Fig. 10) symbolize the mind as uncultivated and as perfected by education. Fig. 11, the three pillars supporting the lodge, are wisdom, strength, and beauty, and represent the Doric, Ionic, and Corinthian styles respectively. Fig. 12 (a portion of the mosaic pavement of the lodge) suggests the variety of creation, the indented border referring to the planets which surround the earth; in Fig. 8, from the Jewel of a Royal Arch Mason, the central sun symbolizes the Creator, the interlaced triangles, the elements of fire and water, and the circle eternity and infinity.

more restricted powers later, and the appointment of wardens for each trade, were indications of the need of regulating the trades of whom the masons were an integral part. In 1590 the direct control of the masons by the king is evidenced by the confirmation by James VI. of the election of Patrick Copland, laird of Udaught, as 'wardane and justice' for three Scottish counties. A still older

men uniting with the masons in favour of 'Sir William Sinclair, now of Roslin, as patrones and protectors.' The signatories to 1601-2 belonged to lodges in Edinburgh, St. Andrews, Acheson-Haven, Haddington, and Dunfermline; and those of 1628 (circa) were deacons and wardens of the Lodge of Edinburgh, Glas-gow, Ayr, Stirling, Dundee, and St. Andrews, including in some

In 1655-6 the prefix *free*, which had been regularly used for many years before (and in England occasionally from the 14th century), was dropped, the company of 'freemasons' being altered to 'masons.' When the 'acception' ceased to work is not apparent, but probably late in the 17th century, through the activity of independent lodges; and the familiar title of 'free and accepted masons' came into use to designate the speculative about the same time. The 'acception' had a copy of the 'old charges,' which has, unhappily, been missed for some time; but its use by the accepted masons testifies to the survival of operative customs among the speculative lodges during the 17th century, and inferentially much earlier. There are other indications of masonic activity in England during the same period, though the records have been lost, as in Staffordshire, on the testimony of Dr. Plot, in his history of 1686; also in Cheshire, *Harleian Manuscript*, No. 2,054, British Museum (c. 1660); and Randle Holme in his *Academie of Armory* (1688); besides references such as by Aubrey in 1691, and particularly the old lodge at York, which developed into a grand lodge (1725), but collapsed before the century ended.

According to Dr. Anderson in the second edition of the *Book of Constitutions* (1738), 'the few lodges at London, finding themselves neglected by Sir Christopher Wren, thought fit to cement under a grand master as the centre of union and harmony.' Four of these lodges (or more) met at the Apple Tree Tavern in Charles Street, Covent Garden, in 1716, and decided to form themselves into a grand lodge; and on St. John the Baptist's day, 1717, the premier grand lodge was thus formally inaugurated at the Goose and Gridiron in St. Paul's Churchyard (demolished in 1895). Three of these old lodges still continue in the city of London. The absurdity of claiming Sir Christopher Wren as head of the craft will be manifest from the fact that there is not a scrap of evidence to prove that he was ever actually initiated, though he may have been, but not before 1691, long after he was said to be grand master.

The example of England was soon followed by Ireland, in 1725 or before; and Scotland made a late third in 1736.

From these three grand lodges, directly or indirectly, have originated all the other regular lodges and grand lodges throughout both hemispheres; so that modern freemasonry, through that trio, has

descended from speculative and operative ancestors, whose forebears were cathedral builders and freemasons, and established on a Christian basis peculiar to Great Britain.

The new grand lodges, being constituted on a cosmopolitan foundation, soon became popular, and spread rapidly at home and abroad. Lodges were chartered for the Continent, India, and the colonies of the British empire, provincial grand masters being appointed from 1726, so as to secure more efficient supervision. Distinguished noblemen were elected as grand masters, and the society became quite fashionable, especially after the initiation of H.R.H. Frederick Prince of Wales in 1737, the first of nearly twenty members of the British royal family who have 'aprons put on, and made themselves one with free and accepted masons.' His Majesty King Edward VII. (initiated in 1869) was grand master of England from 1874 to 1901, but is now 'protector of the order,' and has been succeeded as grand master by H.R.H. the Duke of Connaught.

From a comparatively insignificant origin in 1717 of the original grand lodge have sprung over one hundred independent grand lodges, with about twenty thousand lodges, and nearly two millions of active and retired members. Freemasonry was introduced into Ireland early in the 18th century. The first lodge was opened in Dublin; but owing to the fact of the population being so largely Roman Catholic, masonry has not made marked progress. There are, however, between three hundred and four hundred lodges. Masonic lodges are to be found in greater or less numbers in nearly every country of the world, but especially among the Anglo-Saxon and Teutonic races. The number of lodges in the United States and other parts of both North and South America has increased with leaps and bounds since the first lodge was founded in Philadelphia in 1730, and the craft can now claim over 1,000,000 members in the United States and Canada alone. The standard works on the general subject are Gould's *History of Freemasonry* (1884-7 and 1903); Hughan's *Old Charges of British Freemasons* (1872 and 1895); Lane's *Masonic Records 1717-1894* (1895); Conder's *Records of the Hole Crafte and Fellowship of Masons* (1894); Lyon's *History of the Lodge of Edinburgh and Freemasonry in Scotland* (1873 and 1900); Dr. Chetwode Crawley's *Cementaria Hibernica* (1895-1900), and *Ars Quatuor Coronatorum* (1886-1905).

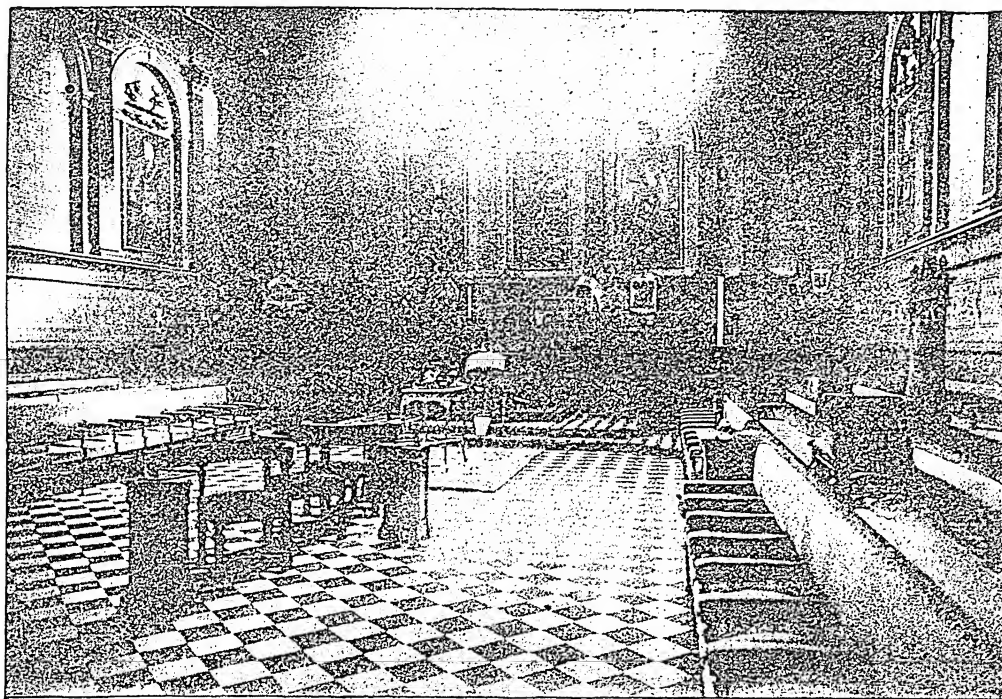
Freemen. Before the Municipal Corporations Act, 1835, the right to be admitted a freeman of a borough generally depended upon birth (*i.e.* being the child of a freeman), servitude (*i.e.* having served as apprentice to a freeman), marriage, gift, or purchase, and each borough had its own customs and bye-laws regulating the admission. That act prohibited the admission of freemen by gift and purchase, but preserved admission on the ground of birth, servitude, and marriage. Freemen by birth or servitude, who have resided for six months in or within seven miles of a borough, are entitled to be registered as parliamentary electors for the borough. Under the Honorary Freedom of Borough Act, 1885, the council of a borough may admit to the freedom of the borough persons of distinction, or persons who have rendered eminent service to the borough, but these honorary freemen obtain no rights of voting or of sharing in the benefit of common lands or other property. As to freemen and liverymen of the City of London, see LONDON—Government.

Free Port, a seaboard town, in which either (1) no duty is charged on imported goods, and where any operation of industry or commerce may be carried on without state or territorial imposts; or where (2), within a certain defined area, such operations may be carried on free of any duty, either fiscal or excise. Those Chinese ports termed 'free' come under neither of these categories, but are simply open to foreign trade, no absence of duties being implied. Among the leading free ports in the middle ages were the Hanse towns, Leghorn, Genoa, Venice, and Marseilles; in later times, Bayonne, Ancona (1696-1868), Messina (1695-1879), Fiume (1745), Trieste (1717), Archangel (1553-1648). Until the time of the Zollverein there were a number of 'free ports' in Germany, but of these only Hamburg retains its special character. Other free ports have been established at Hong-kong, at Singapore, at Copenhagen (1894), and at New Orleans (1896). The coal-stations of Aden, Gibraltar, and St. Helena are practically, though not absolutely, free ports.

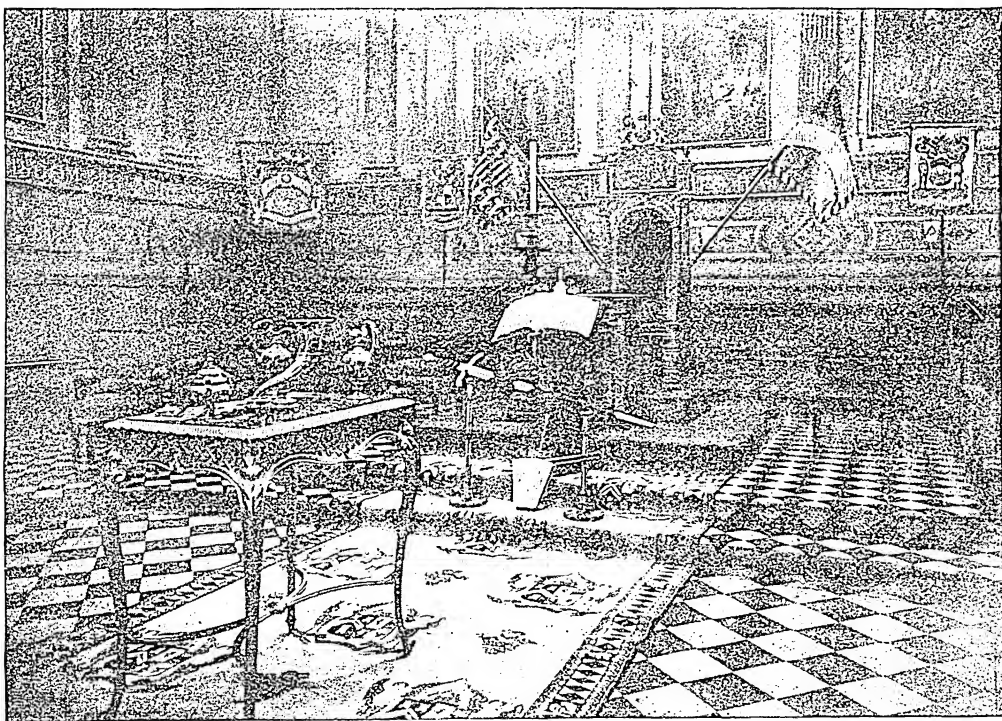
Freeport, city, Illinois, U.S.A., the co. seat of Stephenson co., 114 m. W.N.W. of Chicago. In 1858 it was the scene of the famous debate between Lincoln and Douglas, in which the latter formulated the 'Freeport' heresy. See SLAVERY. Pop. (1900) 13,258.

Free Presbyterian Church, a section of ministers, office-bearers, members, and adherents

1



2



Freemasonry: Mark Masons' Hall prepared for Grand Lodge Meeting.

1. General view. 2. Chair of the Grand Master and the golden consecration vessels.

of the Free Church of Scotland who felt constrained to secede from their brethren when the Declaratory Act was passed in 1892, by which the church declared what doctrines in the Confession of Faith were to be regarded as essential and what as no longer binding, in their strict sense, upon its ministers and office-bearers. The act was merely explanatory, not obligatory.

Free Reed is a name given to a kind of mechanism in use in certain musical instruments. There are various forms, but in all the tone is produced by the periodic vibration of a strip or *tongue*—usually of metal—fastened at one end over an orifice only slightly larger than the tongue, and having the latter so adjusted that a current of air will cause it to vibrate without coming in contact with the edges of the orifice. See HARMONIUM, ORGAN, REED.

Freesia, a genus of Cape bulbous plants belonging to the order Iridaceæ. The species from which all the garden varieties have been derived is *F. refracta* or *F. odorata*, which bears nearly white, long, tubular flowers, the segments of the tube spreading horizontally at its mouth. They make excellent room or conservatory plants, and are easily multiplied by seeds or division of bulbs. They like a well-drained light soil containing a certain proportion of leaf-mould and well-decayed manure. Freesias readily lend themselves to forcing.

Free Soil Party, THE, in the United States, came into existence in 1848, and advocated non-extension of slavery in the newly-acquired territory of the United States. It was composed of Abolitionists—formerly Democrats and Whigs, who had left their party conventions upon their failure to support that issue. In the convention which was held at Buffalo in August 1848, the Free Soil party had delegates from eighteen states, and nominated Martin van Buren for president, and Charles Francis Adams for vice-president. They polled a large popular vote, but secured no electoral count. Their second convention met at Pittsburgh in 1852, and in the election which followed they fell short of their former vote. In 1854 they opposed the Kansas-Nebraska Bill, and in 1856 became absorbed in the newly-formed Republican party.

Free Spirit, BRETHREN OF THE, a fanatical sect which sprang up in Strassburg in 1212, and promulgated a pantheistic doctrine. The sect afterwards became merged in the Beghards and similar schismatic bodies.

Freestone. Rocks are known as 'freestones' when they are finely granular, uniform in texture, without well-marked lines of bedding, and split readily in any direction, whether along the beds or across them. Freestones dress readily, are suitable for carved work, and may be used for massive architecture, as they are uniform, and give solidity of appearance to the masonry. Most freestones are varieties of sandstone. Such are the Craigleith freestone and many other building stones used in Scotland and the north of England. Portland freestone and Bath freestone are oolitic limestones.

Freetown, chief tn. in British colony of Sierra Leone, on the W. coast of Africa, has a good harbour, fortified, and 30,033 inhabitants (1901). It is a coaling station of the British fleet. Fura Bay College, close by, belonging to the English Church Missionary Society, is affiliated to the University of Durham.

Free Trade. Freedom of trade, as the term has been used since the time of Adam Smith, means the removal of all restrictions on commerce that favour one form at the expense of another. It involves, in particular, the equal treatment of home and foreign productions. Under this system no preference is shown to either class, and consumers can choose the most suitable articles without having to pay a penalty for their selection. Encouragements to or restrictions on the export of commodities are also a violation of the free-trade principle, since they tend to disturb the natural economic conditions.

This policy, derived from the teaching of the *Wealth of Nations* (1776), and adopted in its entirety by Great Britain since 1860, rests on a few broad general propositions which are amply supported by experience. (1.) The private individual is the best judge of his own interest in matters of trade, or, at the lowest, is a better judge than any government can be. (2.) In the pursuit of his private interest, each individual directs his commercial dealings in a manner, on the whole, more conducive to the general interest than if he were guided by state control. (3.) That as consumption is the end and aim of all production, what is beneficial to the consumers must be for the interest of the community. (See INTERNATIONAL TRADE.) Freedom affords the widest possible scope for international specialization of industry. Each country, by abandoning or diminishing those branches of production in which it finds itself at a disadvantage, is able

to use all its industrial powers in the most suitable directions. Manufactures, in particular, will gain by concentration in the most favourable situations. Improved organization under the system of large production increases output and reduces cost. Even in agriculture and mining, the drain on natural agents, through increased demand, will lead to the opening up of fresh areas, and to the adoption of the most approved methods. Free trade, in fact, allows of the highest return being obtained from the natural agents, labour and capital, employed in production.

By a great many persons free trade is regarded as a theory incapable of being reduced to practice, and various exceptional cases have been suggested in which a departure from the rule of freedom may be desirable. The fact that the policy of most civilized nations is hostile to free trade raises, it is maintained, a presumption against it which is entitled to consideration. Indeed, even among free traders there is a disposition to regard the matter as one involving very complicated issues, not to be always decided in an off-hand way.

The most important exception on economic grounds is the case of new industries. These, so the argument runs, require the protection of the state in their earlier years in order to overcome the initial difficulties that hamper all fresh enterprises. Such assistance at the outset will be more than repaid in the future when the industries become a source of profit to the community. The real difficulty in this class of cases is to discover the proper objects for encouragement. To avoid selecting any industries but those that (1) need and (2) will ultimately repay the fostering care bestowed on their infancy, calls for the gift of prescience in a degree not possessed by any government, and least of all by those of the modern democratic type. Nor does carefully interpreted experience give force to the plea. Alike in the United States and in Australia the evidence in its favour is of the slightest.

Of somewhat similar character are the departures from free trade proposed in order (1) to increase or retain population and capital, or (2) to preserve the exhaustible natural resources of a country. Each is only capable of application under very stringent limitations, rarely, if ever, realized in practice.

Another group of exceptions is based on political or social considerations, such as the advantages of diversified industry, the necessity of maintaining high

wages, or the supreme interest of national defence.

In most instances the end sought is desirable, but the question remains whether it might not be equally or even better attained under free trade, without the sacrifices that state intervention involves. But, taken in the most liberal sense, these several exceptions cover a comparatively narrow area; the broad practical rule of free trade remains intact as, on the whole, the best policy for the modern civilized state. The reasons which have led to the adoption of a restrictive system by so many countries are best treated under PROTECTION, but here it should be stated that an *economic* justification for their procedure is wholly wanting.

From 1903 until the present date (1906) there has been an active revival of the earlier 'fair-trade' agitation under the title of 'tariff reform.' The arguments used are, in essence, protectionist, but the pleas often used are those of meeting unfair competition and of securing true or real free trade. The most interesting theoretical points in the controversy are (1) the possibility of levying duties which will fall on the foreign producer; (2) the effect of the law of increasing return, which, it is alleged, enables a protected foreign industry to produce a larger quantity at lower cost in consequence of the larger market which such an industry possesses.

The expression 'free trade' has been often employed in other senses as meaning (1) freedom to export without restriction by the action of privileged companies or by the state, or (2) the complete removal of taxes on commodities. The expression 'free trade in land' means the abolition of the legal restrictions on transfer. See Dudley North's *Discourses on Trade* (1691), perhaps the earliest exposition of free trade views; Adam Smith's *Wealth of Nations* (1776); *The Merchant's Petition* (1820) clearly summarizes the free trade case; Bastiat's *Economic Sophisms* (trans. 1888); H. Rawcett's *Free Trade and Protection* (1881) and W. G. Sumner's *Protectionism* (1885) are later statements of the free trade position. Among the numerous publications of the Cobden Club, Farrer's *Free Trade versus Fair Trade* (1886) and B. R. Wise's *Industrial Freedom* (1892) may be specially noticed. W. Smart's *The Return to Protection* (1904) and A. C. Pigou's *The Riddle of the Tariff* (1903) deal with the latest aspects of the question. W. J. Ashley's *The Tariff Problem* (2nd ed. 1904) gives the neo-protectionist point of view. See **TARIFF REFORM**.

Free Will. See DETERMINISM and WILL.

Freezing is the process by which a liquid takes the solid form. This is usually effected by cooling the liquid, or taking heat from it. The temperature at which in any given case this change takes place is called the freezing-point. At this same temperature, under the same physical conditions, the solid will liquefy; hence the freezing-point is the same as the melting-point, or point of fusion. It is usual to speak of substances which are ordinarily liquid as having freezing-points, and substances which are ordinarily solid as having melting-points. The freezing-point of water (or melting-point of ice) is chosen as one of the convenient temperatures for forming a temperature scale. This temperature is called zero on the Centigrade or Celsius scale, and is marked 32 on the Fahrenheit scale.

Freezing-points are affected by change of pressure, being lowered (as in the case of water) when the substance expands on freezing, and raised (as in most other cases) when the substance contracts on freezing. The lowering of the freezing-point of water is only 0.0075 of a degree Centigrade for an extra atmosphere of pressure. It is sufficient, however, to give to ice some of its most important physical properties. Skating is possible because of the lowering of the freezing-point under pressure, the ice melting momentarily under the narrow edge of the skate. Glacier ice flows down valleys because of the melting at the points where the pressure is greatest. This melting at once relieves the pressure, and the water refreezes, moulding itself to the form of the surface.

When a salt is dissolved in water the freezing-point is lowered. Thus, sea water freezes at a lower temperature than fresh water. But what freezes is simply the water, the substance held in solution being, so to speak, frozen out. This separation of the solute from the solvent means work done—hence the necessity for abstracting more heat from the solution. The facts connected with the depression of the freezing-points of solutions have led to an interesting theory, in which the ionization or dissociation of molecules plays an important part. The pathologist has found the phenomenon of the depression of the freezing-point of blood useful in diagnosis. See **SOLUTIONS**.

FREEZING MIXTURES are combinations of substances which by their mutual action produce cooling. The most familiar is the

mixture of snow and salt. The result is to produce liquid brine—that is, snow or ice is melted and the salt is dissolved. But both processes involve the absorption of heat. This heat is taken from objects in the immediate neighbourhood and from the mixture itself. A mixture of salt and snow in the proportion of 33 to 100 lowers the temperature by 20° C. A solution of 6 parts of ammonium nitrate in 10 parts of water produces cooling through 27° C. Seven parts of snow and 10 of crystalline calcium chloride reduces the temperature by 55° C. When solid carbon dioxide is dissolved in ether or chloroform, a temperature of -77° C. is obtained.

Fregenal de la Sierra, city, prov. Badajoz, Spain, 55 m. S.S.E. of Badajoz; has trade in cattle, olive oil, and cork; also mining. Pop. (1900) 9,615.

Freiberg, tn., Saxony, at the N. foot of the Erzgebirge, 25 m. by rail S.W. of Dresden. It is the centre of the Saxon mining industry, and has a famous mining academy, founded in 1765. The cathedral (1484) contains the burial vaults of the electors of Saxony from 1541 to 1694. Gold, silver, bismuth, zinc, nickel, cobalt, sulphuric acid, and arsenic are produced. Pop. (1900) 30,175.

Freiburg, Switzerland. See **FRIBOURG**.

Freiburg-im-Breisgau, tn. and archiepisc. see of Germany, grand-duchy of Baden; is beautifully situated at the W. foot of the Black Forest, 39 m. by rail N.E. of Basel. It trades in timber and wine, and produces silks, cottons, buttons, beer, machinery, etc. It is the seat of a university (2,029 students in 1904-1905), founded in 1460, and, since 1821, of a Roman Catholic archbishop. The cathedral is one of the most remarkable in Germany. The town is backed by the castle hill, formerly surmounted by two castles, which were destroyed by the French in 1744. It was besieged more than once in the 17th century, and passed to Baden in 1806. Pop. (1900) 61,504.

Freienwalde, summer resort and wat.-pl., Prussia, prov. Brandenburg, 40 m. by rail N.E. of Berlin; with chalybeate waters. Pop. (1900) 7,995.

Freight is the price paid to the shipowner for the carriage of merchandise. Speaking broadly, the total freight received must cover the interest and depreciation on the capital invested in shipping, as well as the wages of the seamen engaged, and the incidental charges and expenses of the shipping business. The distribution of the total freight over the different kinds of commodities is governed by rather

must hit the mark chosen by him. The legend was most widespread from the 14th to the 16th century. Appearing in Apel's *Gespenserbuch* (1810), it was afterwards utilized by Weber in the opera *Der Freischütz* (1821). See Grässe's *Die Quelle des Freischütz* (1875).

Freising, anc. tn. and episc. see, Bavaria, on the Isar, 26 m. by rail N.N.E. of Munich, with which it gives title to a Roman Catholic archbishop. Its cathedral dates from the 12th century. It possesses also an agricultural

God through Jesus Christ (1870); *Lay Power in Parishes* (1870); *The Gospel of the Secular Life* (1882); *The World on the Subject of Redemption* (Bampton Lectures, 1885); *Church Reform* (1887); and a trans. of the *Works of St. Jerome and Rufinus* (1893).

Frémiet, EMMANUEL (1824), French sculptor, born at Paris, pupil of Rude; was first known as a sculptor of animals. He then produced a series of statues and groups, mainly equestrian, among them *Joan of Arc* (1874), at Paris. *Condé* (1881); *Joan of*

	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
<i>Coal—</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
South Wales to Gibraltar (per ton).....	5 0	5 6	5 9	6 3	7 6	7 3	5 3	4 6	5 0	4 3
" " Bombay "	7 6	13 0	20 0	12 6	12 6	14 6	10 0	9 0	10 0	6 6
<i>Cotton—</i>										
Mexican Gulf ports to Liverpool (on net register).....	37 6	37 6	37 6	40 0	42 6	45 0	25 0	25 0	33 0	23 6
<i>Jute—</i>										
Calcutta to Dundee (sailing ship).....	27 6	20 0	18 9	27 6	27 6	27 6	20 0	20 0	20 0	25 0
<i>Rice—</i>										
Rangoon to United Kingdom (sailing ship).....	25 0	22 6	22 6	27 6	27 6	30 0	22 6	22 6	20 0	23 9
<i>Wheat—</i>										
San Francisco to United Kingdom (per ton, sailing ship).....	27 6	27 6	25 6	27 6	25 0	36 6	32 6	17 6	12 6	..
New York or Philadelphia to United Kingdom (per quarter).....	2 9	3 1½	3 6	3 7½	3 7½	3 6	2 3	1 6	2 6	2 6
Odessa to United Kingdom (steamer) ..	9 0	10 0	10 0	9 6	11 6	8 6	9 6	8 0	9 0	8 0

school, and a famous brewery.
Pop. (1900) 10,090.

Fréjus (anc. *Forum Julii*), health resort and episc. see, dep. Var, France, 17 m. S.E. of Draguignan. Sardine and anchovy pickling works. Pop. (1901) 4,156.

Fremantle, seapt. tn., W. Australia, at the mouth of the Swan R., 12 m. below Perth. It is the first and last port of call in Australia for all European mail steamers. It has manufactures of soap, tin, leather, tobacco; sawmills and boat-building. Pop. 24,000.

Fremantle, SIR EDMUND ROBERT (1836), British rear-admiral, born at London; served in the Burmese war (1852) and in the Ashanti war of 1873. Raised to the rank of rear-admiral (1885), he was commander-in-chief in the E. Indies (1888-91), in China (1892-5), and at Plymouth (1896-99). He has published an essay on *Naval Tactics*, *Lives of Hawke and Boscawen* in *From Howard to Nelson*; and also *The Navy as I have known It* (1905).

Fremantle, WILLIAM HENRY (1831), English ecclesiastic. After holding a curacy and the charge of Lewknor, Oxon, he became (1806) rector of St. Mary's, Bryanston Square, Marylebone. Later he was Bampton Lecturer at Oxford (1883); was appointed (1882) to a canonry at Canterbury, and became dean of Ripon in 1895. Among his publications are *Reconciliation to*

Arc (1889), at Nancy; *Velasquez*, at Paris; and *Lesseps* (1900), at entrance to Suez Canal. Latterly, Frémiet has dealt with imaginary figures and scenes, several of them drawn from animal life—*e.g.* *Gorilla carrying off a Woman* (1887). See *Life*, in French, by Biez (1900).

Fremont. (1.) City, Nebraska, U.S.A., the co. seat of Dodge co., on the Platte R. about 30 m. N.W. of Omaha. It has dairying and live stock industries, together with machine shops, planing and flour mills. Pop. (1900) 7,241. (2.) City, Ohio, U.S.A., the co. seat of Sandusky co., on the Sandusky R., 30 m. S.E. of Toledo, in the oil and gas fields. Manufactures of engines and agricultural machinery. Pop. (1900) 8,439.

Fremont, JOHN CHARLES
(1813 - 90), American traveller and politician, was a native of Savannah, Georgia. His five chief journeys were made in Oregon, California, and the western seaboard. From 1878 to 1882 he was governor of Arizona. He published a *Report of the Exploring Expedition to the Rocky Mountains in 1842, and to Oregon and N. California in 1843-4* (1845 seq.); and *Col. J. C. Fremont's Explorations* (1859); also a volume of *Memoirs* (1887). See *Life* published by Smucker, Auburn (1856); also Bigelow's *Life of J. C. Fremont* (1856).

Freiligrath, FERDINAND (1810-76), German poet, born at Detmold. The success of his first collection of *Gedichte* (1838) encouraged him to devote himself altogether to literary work. In 1848 he became editor of the *Neue Rheinische Zeitung* in Cologne, and went to England in 1851 to avoid being arrested on account of his *Politische und soziale Gedichte* (2 vols. 1849-51). His verse includes *Qu Ira* (1846) and *Zwischen den Garben* (1849). A collected edition of his works, in 6 vols., appeared in 1877. For his life, see Buchner's *F. Freiligrath* (1881), and G. Freiligrath's *Erinnerungen an F. Freiligrath* (1889).

Freischütz, in German legend, a marksman in possession of magic bullets (*Freikugeln*), six out of seven of which are, by the devil's agency, destined to hit any mark chosen by their owner; the seventh is, however, at the disposal of the devil, and

French, Sir John Denton Pinkstone (1832), British general, was born at Ripple, Kent. He first served in the navy (1866-70), afterwards entering the army (1874). He was with the Nile expedition (1884-5), and was present at Abu Klea, Gubat, and Metamah. He proceeded to South Africa (Oct. 11, 1899), and joined Sir George White's force in Natal. His first achievement was to win the battle of Elandslaagte. By a rare chance he succeeded in leaving Ladysmith in the last train which broke through the Boer cordon. In February 1900 Lord Roberts placed him in command of the cavalry division which had been mobilized at Modder R. The relief of Kimberley followed four days after he left Modder R.



General Sir John French.
(Photo by Lambert Weston & Son.)

(February 15). He then joined in the chase of Cronjé, whom he forced into the death-trap at Paardeberg (February 27). He subsequently moved on the left flank of Lord Roberts's main advance. At the battle of Diamond Hill (June 11, 12) French was called upon to bear the whole brunt of the Boer counter-attack. When Lord Kitchener took over the supreme command on November 29, General French was appointed to the command of the Southern Transvaal. In October 1901 he was appointed to command the 1st Army Corps at Aldershot.

French Beans. See **BEAN**.

French Berries are the unripe berries of *Rhamnus infec-*

torius, one of the buckthorns. The berries are imported from France, and also from Persia, whence they are sometimes known as Persian berries, and are used to dye morocco yellow.

French Broad. See **TENNESSEE**.

French Congo, a colony on w. coast of Africa, bounded on the w. by the Atlantic; behind Kamerun it stretches N. to 10° N. On the E. the rivers Mbomu, Ubangi, and Congo form the boundary; on the S. the Congo Free State and (Portuguese) Kabinda. Estimated area, 450,000 sq. m. The low-lying coast is diversified by the estuary of Gabun (10 m. wide) and the Ogowe mouths. Behind the coast belt rise the Crystal Mts., from 3,000 to 4,500 ft. Farther inland is a plateau rising to nearly 3,000 ft., and cleft by deep river valleys. There are two rainy seasons (September to January, and March to May), and two dry seasons (May to September, and January to March). The natives cultivate manioc; the Europeans, coffee, vanilla, and cacao. Imports (1904), £362,000; exports, £488,000, chiefly india-rubber, palm oil and kernels, ivory, coffee, etc. The French Congo was in February 1906 divided into three administratively distinct colonies, under one commissioner-general—viz. Gabon or Gabon, with its capital at Libreville; the Middle Congo colony, with its capital at Brazzaville; and the Ubangi-Shari-Chad colony, having its capital at Fort-de-Possel. Estimated population, 8-15 millions. See Rhyns's *Le Congo Français* (1885); Payeur-Didelot's *Trente Mois au Continent mystérieux: Gabon-Congo* (1900); Guillemot's *Notice sur le Congo Français* (1900).

French Guiana, or **CAYENNE**, French colony on the N.E. coast of S. America, separated from Dutch Guiana by the river Maroni and the Aoua (Itany), and from Brazil by the Oyapok and the Tumuc Humac-range. Its surface and geology are similar to those of the other Guianas, except that there is high ground near the sea. Other rivers are the Aprouague, Cayenne, Sinnamarié, and Mana, all obstructed by falls. About 6,500 convicts are confined at Cayenne, the Iles du Salut, and on the Maroni R. Captain Dreyfus was confined on the Ile du Diable, one of the three Iles du Salut. The sugar plantations have been abandoned, and only a little coffee and cocoa are produced. Rosewood and guano are exported, but gold is the principal article, accounting for 95 per cent. of the exports. Area, about 30,500 sq. m.; pop. (1901) 32,908. The cap-

ital and port is Cayenne. The colony sends one deputy to the French National Assembly. The first French settlers landed in 1604. See Coudreau's *Dix Ans de Guyane* (1892); Verschuur's *Voyage aux Trois Guyanes* (1894).

French Guinea, colony of France on the w. coast of Africa, lies between Sierra Leone and Portuguese Guinea, and stretches from the Atlantic inland to about 7½° w. The coastlands are low and flat. About eighty miles inland begins the highland region of the Futa Jallon, rich in cattle and gold. The principal products are india-rubber, rice, millet, palm kernels, ground nuts, and wax. Total trade (1904), £1,140,000 (exports, £548,000), chiefly in cotton goods (imported) and rubber (exported). Area, 95,000 sq. m.; pop. about 2,000,000; cap. Konakri. The colony was separated from Senegal in 1893. Its boundaries were fixed in 1899.



French Guiana.

French Honeysuckle. See **HONEYSUCKLE**.

French Indo-China. See **INDO-CHINA, FRENCH**.

French Revolution, THE. The intellectual movement of the 18th century, connected with the names of Montesquieu, Diderot, Voltaire, and Rousseau, prepared men's minds for the problems which the revolution was to force upon the attention of the world. But the principal causes of the French revolution were rather political and economical than intellectual. The continual misgovernment of France since the death of Louis XIV., and the constant irritation felt by the middle and lower classes at the existence of the relics of feudalism, led the Third Estate to seize the opportunity afforded by the bankruptcy of the government to insist upon drastic changes in the administration. Recognizing the neces-

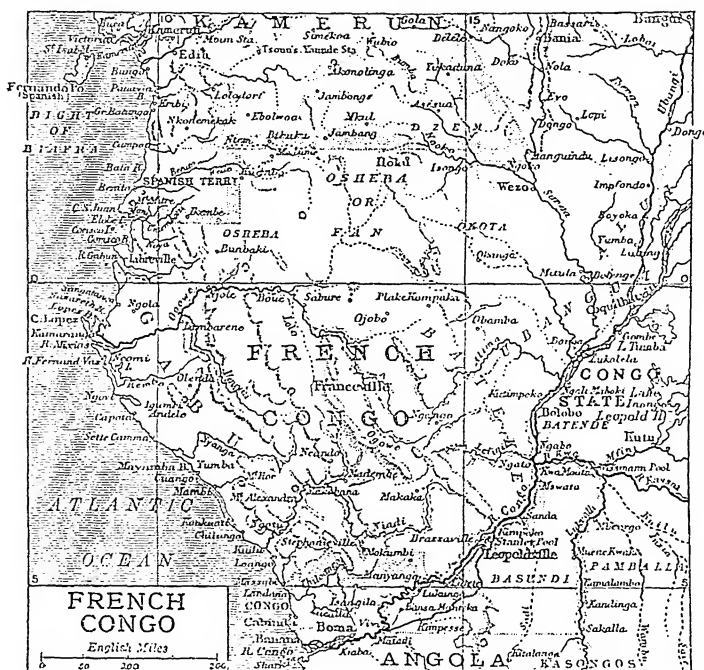
sity for reorganizing the financial resources of France, and for revising the whole system of taxation, Louis XVI. had consented to the summoning of the States-general. On May 5, 1789, the first States-general since 1614 met at Versailles. Sweeping aside the obstacles placed in its way by the nobles, the higher clergy, and the court, the Third Estate declared itself the National Assembly. An attempt of the court to effect a *coup d'état*, which included the dismissal of Necker, and the suppression of the revolution by force of arms, was answered by the Paris mob by the capture of the Bastille (July 14). The king then yielded on all

lower the price of bread, a mob of men and women marched to Versailles on October 5, and on the following day brought the king and royal family to Paris. The king and National Assembly were now in the power of the Parisians, the royal family being practically imprisoned in the Tuileries, and the Assembly sitting hard by in the *manège*, or riding-school. From October 1789 to September 1791 the French National Assembly busied itself with framing a constitution, and in carrying out reforms. On Nov. 2, 1789, the property of the church of France was confiscated; on Feb. 13, 1790, all monasteries and religious houses were suppressed;

a quarrel between that power and England over Nootka Sound. Shortly after Mirabeau's death the king attempted to fly from France. Captured at Varennes, he was brought back to Paris, and was more strictly guarded than ever.

Meanwhile the Assembly had completed the constitution, which became law in September 1791. Local governments were established, and all officials were elected. A new and in many ways excellent system of justice was set up, and the old *parlements* were abolished. Before dissolving, the Assembly passed a self-denying ordinance prohibiting any member of the Constituent Assembly from becoming a member of the new Legislative Assembly, which met in October 1791. Thus the solution of new and difficult problems was left to inexperienced men, who had to a great extent been elected under the influence of the Jacobin Club. In this Assembly the leading section was composed of Girondists, so called because they came from the Gironde, and of whom the leading representatives were Vergniaud, Gensonné, and Guadet; connected with them were Roland and Madame Roland, Brissot, Isnard, and others. These men were republicans, and desired a war with Austria, in the hope that the French king's overthrow would ensue, and that a republic would be formed.

In addition to the question of the punishment of the clergy who refused to take the oath to the civil constitution, there was the burning question of the *émigrés*. Large bodies of French nobles were at Worms and Koblenz, watching for an opportunity of returning and of overthrowing the revolution. The Girondists demanded that the emperor Leopold should expel the *émigrés* from German territory, and on April 20 Louis XVI. declared war upon Austria. Defeats on the frontier led to the insurrection of June 20, 1792. Then another insurrection was organized by the Jacobins; and on Aug. 10, 1792, the king was deposed, a republic set up, and a national convention summoned. Further reverses on the frontier led to the September massacres, and to determined efforts to repel the invaders. On September 20 the Prussians were defeated at Valmy, and the French armies advanced across the frontier. The Rhine was reached, Savoy and Nice occupied, and by the battle of Jemappes (November 6) Belgium was conquered, and the Scheldt declared open to the commerce of the world. Europe now became thoroughly alarmed, and even Pitt recognized that war



points, and till 1792 the revolution was carried through by the middle classes, who placed the government of Paris in the hands of Bailly and Lafayette.

The first duty of those in power was to check the riots which were taking place all over France, and to draw up a constitution. On Aug. 4, 1789, all feudal rights, together with privileges of every description, were abandoned. Then a Declaration of the Rights of Man was drawn up, the king was given a suspensive veto, and it was settled that the Assembly should consist of only one chamber. Fearing lest the king should escape and dissolve the Assembly, and believing that the king's presence in Paris would

and on Dec. 26, 1790, the civil constitution of the clergy became law. All benefited clergy were to be elected, and every benefited priest was to take an oath to observe the new civil constitution. A schism was the immediate result. Mirabeau attempted to guide the Assembly in the direction of a limited monarchy such as existed in England. But on Nov. 7, 1789, the deputies rejected his proposal that ministers should sit in the Assembly, and the indecisive character of Louis XVI. destroyed all chances of the execution of any of Mirabeau's admirable schemes. He was at any rate able by his influence to prevent France from taking up the cause of Spain in

might ensue. Flushed by their victories, the arrogance of the French showed itself in the declarations of November 19 and December 15, in which they called upon all nations to rise against their rulers, and in their evident intention to invade Holland.

Meanwhile the Girondists and the Jacobins were engaged in a struggle for supremacy. While the former accused the Jacobins of wishing to establish a dictatorship, the latter replied by accusing the Girondists of wishing to set up a federative republic, in order to lessen the power of Paris, and to increase that of the provinces. On Jan. 21, 1793, the Jacobins, with the connivance of the Girondists, brought about the execution of Louis XVI., and on February 1 declared war upon England and Holland. Spain, Portugal, the Empire, Tuscany, and the Two Sicilies at once declared war upon France. The defeat of the French at Neerwinden on March 21, 1793, and the flight of Dumouriez, the Girondist general, led to the overthrow of the Girondists. The situation was critical. A royalist rising had broken out in La Vendée, and many departments favoured the Girondists. The Jacobins published the republican Constitution of 1793; to defend France they formed the Grand Committee of Public Safety (July 10). The rule of this committee is known as the Reign of Terror, and lasted for a year. An institution known as the Committee of General Security dealt with all police matters, while the revolutionary tribunal, founded in March 1793, took cognizance of all political offences, and, as a rule, inflicted the penalty of death. Jacobin deputies were regularly sent on mission, and thus the provinces were brought into subordination to Paris. In the Grand Committee of Public Safety were to be found Carnot, Robespierre, St. Just, Couthon, Jean Bon St. André, Lindet, Prieur of the Côte d'Or, and Prieur of the Marne, and in September Billaud-Varenne and Collot d'Herbois were added. The revolt in La Vendée was put down, and the allied troops were driven from the frontiers. The victories of Hondschoote (September 8) and of Wattignies (October 16), together with the recapture of Toulon (December 18), freed France of all fear of invasion.

Success was, however, at once followed by quarrels among the Jacobins. Robespierre looked with suspicion upon Hébert, who was popular with the mob in Paris, and he distrusted Danton, who was in favour of a relaxation

of the system of terror. On March 14, 1794, the Hébertists were executed, and on April 5 the Dantonists suffered the same fate. Robespierre was now supreme. Though the government failed at sea, the French fleet being defeated on June 1 by Lord Howe, on land the Austrians were disastrously defeated at Fleurus. The Reign of Terror becoming more and more oppressive, a conspiracy was hatched in the Convention itself, and on July 26, 1794 (9th Thermidor), Robespierre was overthrown. This Thermidorian reaction lasted a little over a year, during which the party in favour of moderation gradually gained ground. The extreme Jacobins were in some cases executed, and a party called the *jeunesse dorée* made itself conspicuous by attacking all who sympathized with the régime of terror. The Jacobin Club was closed, seventy-three proscribed sympathizers with the Girondists were restored to their seats in the Convention, and early in 1795 several outlawed Girondists were allowed to return. The Jacobins were not, however, willing to yield without resistance, and on April 1, 1795, they made the insurrection of 12th Germinal, followed by one on May 20, known as that of 1st Prairial. Both of these risings were to some extent bread riots, caused by the misery in parts of Paris. As Louis XVI.'s brother, the Count of Provence, refused to recognize that the *ancien régime* was over, the government drew up a new constitution, known as that of the year III. The executive was placed in the hands of five directors, and the legislature consisted of two chambers—the Council of Ancients and the Council of Five Hundred. One-third of the two councils were to retire annually, and while the Council of Ancients was concerned with diplomatic questions, the Council of Five Hundred initiated fresh taxation. To the directors was allotted the control of the armies and the fleets, the direction of foreign policy, and the management of the internal administration. The government which drew up this constitution could boast that during the year 1795 French armies had conquered Holland, invaded Spain and Germany, had broken up the coalition, and had overthrown an attempt of the *émigrés* at Quiberon. None the less, on October 5 the insurrection of the 13th Vendémiaire broke out, and was only quelled by the assistance of the cannon of the young Bonaparte. The rising being suppressed, the Convention hastened to elect the first five directors, and France entered upon

the period known as that of the Directory. The first and principal phase of the French revolution—extending from 1789 to 1795—was now over, and though a republican government continued in office till 1799, it was merely the inevitable prelude to the consulate and the empire.

See Sybel's *Hist. of the French Revolution* (Eng. trans. 1867-9); Sorel's *Europe et la Révolution Française* (1883, etc.); Morse Stephens's *The French Revolution* (1886); Taine's *The Ancient Régime and the Revolution* (Eng. trans. 1876-83); Carlyle's *The French Revolution* (1837); and histories of the revolution by Mignet (1824), Michelet (1847-53), Louis Blanc (1847-63), Quinet (1865), and Thiers (Eng. trans. 5 vols. 1895); Tocqueville's *France before the Revolution* (Eng. trans. 1888).

French West Africa. See SENEGAL, FRENCH GUINEA, IVORY COAST, and DAHOMEY.

Frenssen, GUSTAV (1863), German novelist, born at Barlt in Holstein; was from 1890 to 1902 Lutheran pastor at Hemme, also in Holstein. His novels consist of *Die Sandgräfin* (1896, over twenty editions), crude and immature; *Die drei Getreuen* (1898, nearly fifty editions); *Jörn Uhl* (1901), a striking and in some respects a powerful book, which reached 150 editions in two years; and *Hilligenlei* (1905), which contains a 'Life of Christ' based on the teaching of the Higher Criticism.

Frere, SIR HENRY BARTLE EDWARD (1815-84), English statesman, was born at Clydach, Brecknockshire, and entered the Indian civil service (1834). He became chief commissioner in Sindh (1850-9), member of the viceroy's council (1859-62), and governor of Bombay (1862-7). His mastery of Indian vernaculars, and his intimate knowledge of native character, made him an authority on all questions of Indian administration. The system of revenue settlement which he instituted in Bombay was extended to Mysore and Berar. His firmness and grasp of the situation not only saved Sindh in the dark days of the mutiny, but materially assisted in averting the disasters which threatened Central India and the Punjab. In 1872 he secured from the sultan of Zanzibar a treaty for the abolition of slavery throughout his dominions. In 1877-81 he was governor of the Cape, and first high commissioner of S. Africa. The aim of his policy was South African confederation. See *Life* by Martineau (1895).

Frere, JOHN HOOKHAM (1769-1846), English author and diplomatist, was born in London.

While sitting as member for West Looe in Cornwall (1796-1802), he published, in conjunction with Canning, the *Anti-Jacobin*, or *Weekly Examiner* (1797-98), to which he contributed some of the wittiest *jeux d'esprit* in the collection. After serving in 1799-1800 as under-secretary of state, he was appointed envoy to Lisbon, and then to Madrid (1802-4, 1808-1809). The remainder of Frère's life was spent in retirement, chiefly at Malta, where he made his unrivalled translations of Aristophanes—*The Frogs* (1839), *The Acharnians*, *The Knights*, and *The Birds* (1840). His *Theognis Restitutus* (anon. 1842) appeared in Bohn's Classical Library. See *Memoir* by Sir Bartle Frère in *Collected Works* of J. H. Frère (1874); also Introduction to Frère's *Aristophanes* (1886), by Professor Morley, and *Life*, in German, by Eichler (1903).

FRÈRE, PIERRE EDOUARD (1819-86), French genre painter; born at Paris, entered the studio of Delaroche. His first exhibits appeared in the Salon of 1843, and he soon acquired a wide reputation for delicate and sympathetic rendering of scenes from humble life. His studies of child-life have especial charm, showing close observation, combined with naïveté and simplicity. All his works show great care and accuracy in execution. Among his pictures are *The Hen with the Golden Eggs*, *Rest, The Student, Prayer*, and *The Gleaner Boy*.

FRÈRE-ORBAN, HUBERT JOSEPH WALTHER (1812-96), Belgian statesman, born at Liège. Elected liberal member for Liège in the Belgian Parliament, he became minister of public works, and in 1848, as minister of finance, successfully tided over the financial crisis by the foundation of the Belgian National Bank. His work, *La Main-morte et la Charité*, appeared in 1854. Once more appointed minister of finance (1857), he remained in office with one short interval until 1870; entrusted in 1878 with the formation of a new cabinet, he endeavoured to combat the Clerical party by a new scheme of education (1879). The disaffection of the Radicals, however, led to the fall of the ministry in 1884. Frère-Orban wrote *La Question Monétaire* (1874) and *La Question Monétaire en Belgique* (1889).

FRÈRE TOWN, or KISAVNI, on the coast of British E. Africa, 2 m. N.E. of Mombasa; headquarters of the Church Missionary Society in British E. Africa. Pop. 2,000.

FRÉRON, ÉLIE CATHERINE (1719-76), French critic, born at Quimper; at twenty became professor in the Collège de Louis-

le-Grand at Paris. He founded the journal *Lettres de la Comtesse de...* (1746), and on its suppression (1749) *Lettres sur quelques Ecrits de ce Temps*, which, in 1754, became *L'Année Littéraire*. In these periodicals Fréron, as the champion of church and throne, attacked Voltaire and the Encyclopédistes, provoking from the former a reply in the satirical drama *L'Ecossaise*. See *Les Confessions de Fréron*, by Barthélemy (1876); *Les Ennemis de Voltaire*, by Ch. Nisard (1833).

Fresco. The art of painting, or the work of art produced by painting, with a water-colour medium upon either freshly laid or damped plaster is known as 'fresco.' The latter method, usually spoken of as *fresco secco*, is understood to be the more ancient, and to have been that employed in the decoration of Etruscan tombs, and in Egypt; but true fresco, the *buon fresco* of the Italians, is also of great antiquity, having been used in Rome and Pompeii. *Secco*, however, has outlasted fresco in actual practice, being still extensively used for the rougher kinds of decorative work, while fresco is now seldom used, and then only in experimental form. In *secco* the plaster ground, being already existent, or having been prepared and allowed to dry thoroughly, is well damped before the artist begins his work, and forms a partially absorbent ground for the colours when applied, and wall and decoration dry together. But the great decorations of the 14th, 15th, and 16th centuries were executed in fresco—i.e. upon freshly-laid plaster. The palette available is a restricted one; for the colours, having to stand the action of the lime in the plaster, the union of which with the pigments forms carbonate of lime, are principally those obtained from natural earths. Before beginning to paint, however, the artist usually prepares a coloured sketch and a full-sized cartoon of each subject. Fresh plaster sufficient for a day's work is laid upon the wall, and then with a blunt iron stylus the outlines of the cartoon, held against the plaster, are traced, leaving indented lines on the surface beneath. The artist then proceeds with the actual painting, working with great rapidity and precision; for everything that can be expressed in one painting has to be done, and the work carried as far as possible. For retouching will never equal the original work in softness, spontaneity, and style; while, having to be done in *tempera*, it will not be nearly so permanent as the fresco itself.

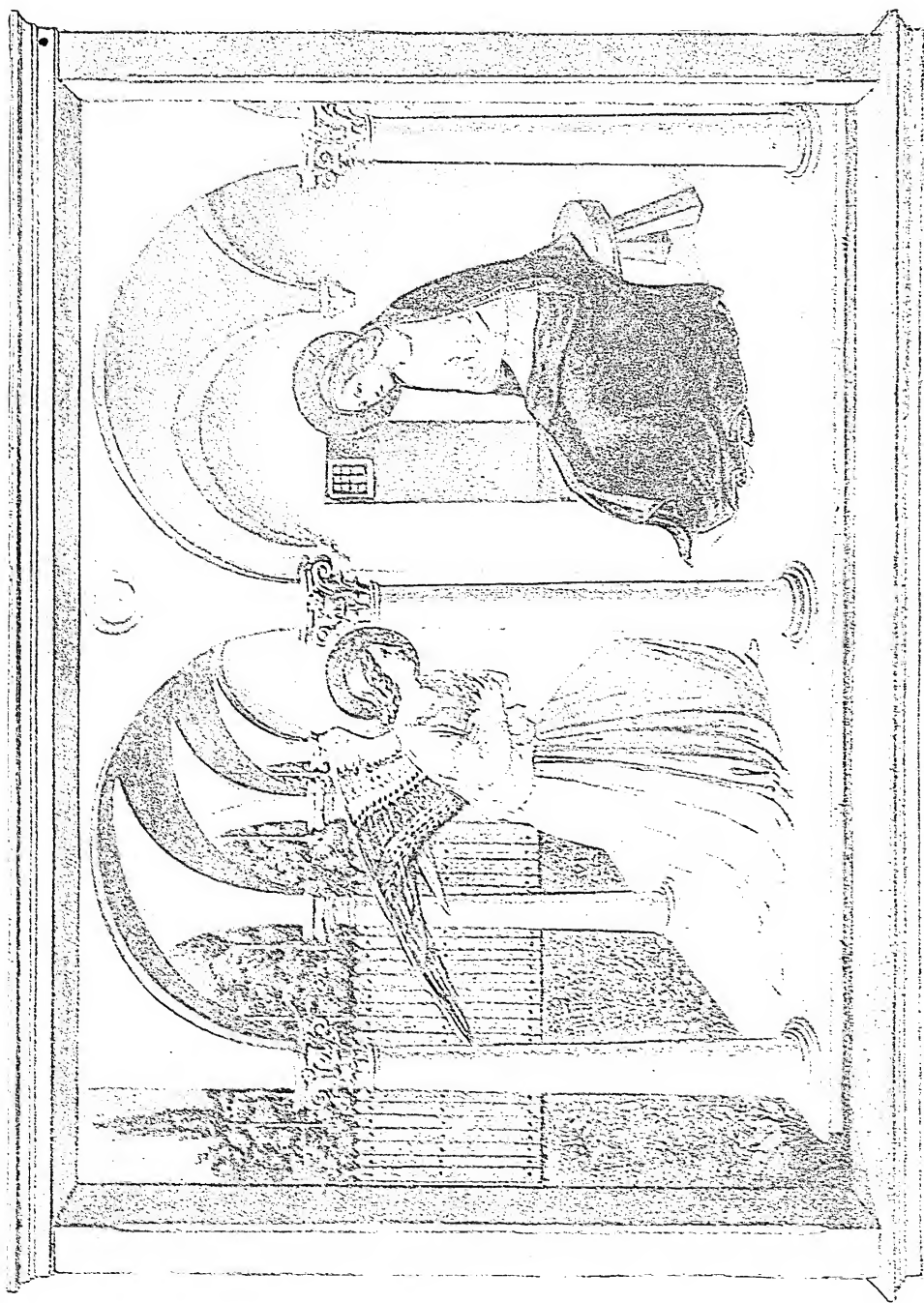
The famous mural decorations

of the earlier Italian schools were executed in fresco; and those of the Campo Santo at Pisa, of the Arena chapel at Padua, of the church of S. Maria Novella, the convent of S. Mark and the Riccardi chapel in Florence, of the Siena library, of the stanze of the Vatican and the Sistine chapel, and of Parma cathedral may be taken as typical of the achievement of the great masters of this medium. After the introduction of an oil medium by the Van Eycks early in the 15th century, however, fresco was gradually displaced, and the most characteristic decorations of the latter half of the 16th century—the gorgeous wall pictures of the great Venetians—and of the 17th were executed in oils. During the 19th century an attempt was made by a group of German painters, known as 'Nazarenes' (Overbeck, Cornelius, and others), to reintroduce fresco decoration on a large scale; but their efforts were not crowned with perfect success. In Britain a similar attempt was made about 1845, in connection with the decoration of the new Houses of Parliament. The best result of this was Dyce's frescoes in the royal robing-room at Westminster.

FRESCOBALDI, GIROLAMO (1583-1644), Italian musical composer and organist, born at Ferrara. He early gained a reputation as a singer, and later as an organist. In 1614 he was appointed organist at St. Peter's, Rome. Among his pupils was J. J. Froberger, the German organist. He wrote numerous works, both instrumental and vocal.

FRESC, JAKOB (1691-1728), Swedish poet, born at Viborg in Finland; was a clerk in the Swedish chancery at Stockholm. The weak health which clung to him all his life has impressed itself on all he wrote. He is seen at his best in his beautiful hymns and his exquisite poems on the 'Spring.' His *Samlade Dikter* appeared in 1876.

FRESHFIELD, DOUGLAS WILLIAM (1845), English explorer and mountaineer, born at Kidbrooke Park, Sussex, was the first to climb Kazbek in the Caucasus, also the eastern summit of Elbruz, and has published a map of the Caucasus, embodying much new information. About 1899 he made a remarkable journey round Kanchenjunga at a high level. He has worked hard to raise the standard of geographical education. His best-known works are *Travels in the Central Caucasus and Bashan* (1869), *Italian Alps* (1875), *Exploration of the Caucasus* (1896), *Round Kanchenjunga* (1903), and Alpine guide-books. He edited the *Alpine Journal* (1872-80).



A Famous Fresco by Fra Angelico in the Convent of S. Mark, Florence — 'The Annunciation.'

Fresco, or the art of painting on freshly-spread plaster, is of great antiquity, and was employed in the decoration of Egyptian tombs and in ancient Egypt and Rome. The greatest Italian masters largely made use of this art to express their deepest conceptions of religion on the walls of cathedrals and other buildings.

Freshwater, par. and bathing resort in w. of the Isle of Wight, England. Farringford House in the neighbourhood was a residence of Tennyson, and is now occupied by his son. Pop. (1901) 3,306.

Fresnel, AUGUSTIN JEAN (1788-1827), French physicist, born at Broglie (Eure); was an engineer of the Ecole des Ponts et Chaussées, but lost his post on Napoleon's escape from Elba. He then turned to physics, but was subsequently reinstated, and became secretary of the lighthouse department. His discoveries established the undulatory theory of light, first advanced by Young. He invented the Fresnel lenses for lighthouses, and introduced revolving lights. See Biography, by Arago, in vol. i. of Fresnel's *Œuvres Complètes* (3 vols. 1866-70).

Fresnillo, tn., state Zacatecas, Mexico, at the base of Cerro del Proaño, 35 m. N.W. of Zacatecas; has important silver and copper mines. Pop. 7,000.

Fresno, city, California, U.S.A., the co. seat of Fresno co., in the valley of the San Joaquin R., 165 m. E.S.E. of San Francisco. Grows grapes for raisin-making. Pop. (1900) 12,470.

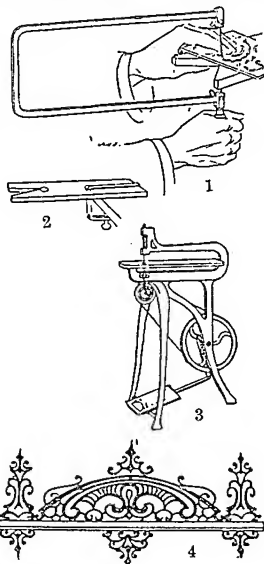
Fret, or FRETTE, in heraldry, a narrow saltire interlaced with a maske at the centre of the shield. *Fretty* is formed by a number of strips in bend interlaced with an equal number in bend sinister, forming a sort of trellis over the whole shield.

Fret Work, or SCROLL CUTTING, is the cutting out of thin board or panel into patterns. The 'buhl', or 'fret saw' proper, is the chief instrument of the art. Its blade, which is a mere thread of metal with teeth, is set in a frame called a 'ben.' The threadlike saw is passed through a hole bored in the piece of wood by a bradawl before being fixed in the frame. Fret machines are modifications of the buhl saw. Fret sawing is as applicable to sheet metal as to wood; for this material the finest saws are used. 'Three-ply' fret wood, used for very fine work, consists of three thin veneers laid with their grains running in different directions, firmly cemented and rolled together. This may also be made from wood shavings. Fret-saw work is extensively employed in pianos, where it is backed with silk. When glued on a panel and finished by cutting, it cannot be distinguished from flat-carving. See WOODWORK; also *Fret Cutting*, by Jack Plane and C. G. Leland (Useful Arts and Handicrafts Series, 1899); and *Fret Work and Marquetry*, by H. Dunning.

Freund, WILHELM (1806-94), German philologist, born at Kempen (Posen) of Jewish parentage. After teaching at Breslau (1828),

at Hirschberg (1848-51), and at Gleiwitz (1855-70), he settled at Breslau, to devote himself to literary work, especially in connection with the classics. His chief work, the *Wörterbuch der lateinischen Sprache* (1834-45), is a standard dictionary. It was followed by two other dictionaries, an edition of Cicero's *Pro Milone* (1838), and a series of school books. His *Wie studiert man Philologie?* (6th ed. 1903), *Triennium philologicum* (2nd ed. 1879-85), and *Wanderungen auf Klassischen Boden* (1889-90) are also worthy of mention.

Freycinet, CHARLES LOUIS DE SAULSES DE (1828), French statesman, born at Foix (Ariège). After the fall of the empire he was appointed head of the military department at Tours; a record of the events with which he was connected appeared in his *La Guerre en Province pendant le Siège de Paris* (1871). Entering the Senate



Fret Work.

1. Fret saw, showing method of using. 2. Cutting board clamped to table. 3. Treadle fret saw. 4. Specimen of fret.

in 1876, and identifying himself with the republican party, he was appointed (1877) to the ministry of public works, and did much to develop the railway and canal systems of France. He has four times held the premiership (1879, 1882, 1886, 1890), and acted as minister for war in 1888, 1889, and 1892-93, resigning in 1893 on account of the Panama scandal. However, in 1898 he again became minister of war in the Dupuy cabinet, but held office only for six months. His foreign policy has been generally favourable to

Russia and unfavourable to Britain. He has published *La Philosophie des Sciences* (1896), also 'Pensées,' published in the *Contemporain* under the name 'Alceste.' He was elected a member of the French Academy in 1891.

Freycinet, LOUIS CLAUDE DE SAULSES DE (1779-1842), French navigator, born at Montélimar. He sailed with the expedition under Captain Baudin to explore the southern coasts of Australia and Tasmania. In 1817 he sailed for S. America. With the collaboration of Arago, Gaudichaud, Pellion, and others, Freycinet embodied the results of the three years' cruise in the *Voyage autour du Monde* (1824-44). He also completed Péron's account of Baudin's expedition. See 'Notices historiques sur Henri and Louis de Freycinet,' by De la Roquette (*Bull. de la Soc. de Géographie*, 2nd series, vol. xx.).

Freycinetia, a genus of ever-green tropical climbing plants, belonging to the order Pandanaceae. In the temperature of the stove, in a light, well-drained soil, they are not difficult of cultivation. The pillars up which they are to climb should be bound with sphagnum peat, so that the Freycinetias may throw out roots into it. *F. Banksii* is the best species.

Freyja, the Norse goddess of the spring, love, and of fertility, was sister to the god Freyr. She was often confounded, and in later times identified, with the goddess-mother Frigga, the wife of Odin.

Freyr, the Norse god of rain, fertility, and peace, was, like his sister Freyja and his father Njord, a survival from the pre-Odinic mythology. His festival was at the winter solstice (Christmas), and a well-known saga relates his wooing of Gerda, daughter of the frost-giant Gymir.

Freytag, GEORG WILHELM FRIEDRICH (1788-1861), German Orientalist, born at Lüneburg. After serving as a chaplain with the Prussian army, he settled (1815) in Paris to study Arabic, Persian, and Turkish with De Sacy. From 1819 until his death he held the professorship of Oriental languages at Bonn. His chief work is a valuable *Lexicon Arabico-Latinum* (1830-7); others are *Hamāsa*, or Arabic songs (2 vols. 1828-51); *Arabum Proverbia* (1838-43); and *Einleitung in das Studium der Arabischen Sprache* (1861).

Freytag, GUSTAV (1816-95), German novelist and dramatist, was born at Kreuzburg, Silesia, and became a lecturer in German language and literature at Breslau (1839). He was editor of the Liberal newspaper *Die Grenzboten* at Leipzig, together with Julian Schmidt, from 1848

to 1861, and from 1867-70. Later on he became editor of a new weekly review, *Im deutschen Reich*. Freytag's fame rests principally upon his dramas and novels. His best plays are *Die Brautfahrt oder Kunz von der Rosen* (1844), a light historical comedy, pervaded by genial humour. The short play *Der Gelehrte* (1844) is a psychological study rather than a drama. In 1847 Freytag wrote two dramas, *Valentine* and *Graf Waldemar*, which were both successful. Freytag's happiest dramatic work was the comedy *Die Journalisten* (1854), of which an excellent English edition (1900) has been prepared by H. W. Eve. It is generally recognized as the best German comedy of the 19th century, and presents a delightful picture of life in a country town, of the complications of local politics, and the conduct of a provincial newspaper. The tragedy *Die Fabier* (1859) was not a great success; and Freytag was led to consider very carefully the theory of the drama, the results of which were published in *Die Technik des Dramas* (1863; Eng. trans. 1894), in which he shows great critical insight, and has left a work of lasting value. In his historical tales he deals with the German past, the first series being issued under the title *Bilder aus der deutschen Vergangenheit* (1859). On a larger scale was the cycle of seven novels entitled *Die Ahnen* (1872-80), covering the period from the *Völkervandern* to the first half of the 19th century. In spite of, or perhaps because of, the historical information conveyed by these novels, their popularity rivalled that of Freytag's earlier attempts in the same domain. Freytag's first novel of modern life was *Soll und Haben* (1835; 60th ed. 1904), which immediately attracted great attention (Eng. trans., *Debit and Credit*, 1858). The complement to *Soll und Haben*, in which the acquisition of wealth is the aim of all labour, is *Die Verlorene Handschrift* (1864; 36th ed. 1902; Eng. trans. 1865), which shows the German scholar and his disinterested and untiring industry, as well as the dangers to which his one-sided devotion exposes him. Freytag was a man of noble character, earnestly opposed to all that was morbid, sentimental, or unctuous, with a gift of humour rare among modern novelists. His collected works, in twenty-two volumes, were issued between 1886 and 1888. For his life, see his own *Erinnerungen aus meinem Leben* (1887; Eng. trans. 1890), and Seiler's *G. Freytag* (1898).

F.R.G.S., Fellow of the Royal Geographical Society.

F.R.Hist.S., Fellow of the Royal Historical Society.

F.R.H.S., Fellow of the Royal Horticultural Society.

Friar. The word is a corruption of the French *frère*, the distinguishing title of the members of the mendicant orders. The first friars were the Franciscans or Grey Friars and Dominicans or Black Friars. To these were added the Carmelites or White Friars by Innocent IV. (1224), and the Augustinian hermits or Austin Friars by Alexander IV. (1256). In the 15th century the Servites and Trinitarians or Crutched Friars were granted the same privileges as the four mendicant orders. See Dr. Jessopp's *Coning of the Friars* (1889).

Friar's Balsam (compound tincture of benzoin) is prepared by dissolving benzoin, storax, tolu balsam, and aloes in strong alcohol. It is used as a stimulating expectorant, and also as a protective coating for fresh wounds.

F.R.I.B.A., Fellow of the Royal Institute of British Architects.

Fribourg, or **Freiburg**. (1.) One of the Swiss cantons, admitted into the Confederation in 1481. It has an area of 644 sq. m. and pop. (1900) 127,951, mostly Roman Catholic; French-speaking 87,541, as against 38,759 German-speaking. The canton is mainly pastoral, and is famed for the Gruyère cheese. (2.) Chief town of the above canton, 26 m. s.w. of Bern. It is famous for the wonderful organ in its chief church (St. Nicholas), and for its two great suspension bridges. It is the seat of a university (350 students). Pop. (1900) 15,794.

Friction. When two bodies rub on each other, there is a force where the rubbing occurs called friction which resists motion. The laws of friction were first investigated by Coulomb in 1781 and Morin in 1831-3, and since then have been studied by many experimentalists.

The ordinary laws of solid friction, true as far as they go, are stated thus: The friction between

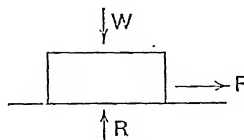


FIG. 1.

the two surfaces of a sliding pair is equal to the total perpendicular pressure between the surfaces multiplied by the coefficient of friction. If w (Fig. 1) be the weight on the plane horizontal surface, the reaction is $R = w$ by the third

law of motion. Then the frictional force is $F = \mu R$, the direction of the force being opposite to that in which motion is about to take place. The coefficient μ depends on the material and condition of the rubbing surfaces, but is independent of the velocity and the extent of the surfaces in contact. Much of the mathematical theory of the subject is founded upon this. F may be measured by the weight suspended in a scale pan necessary to cause sliding (Fig. 2). By taking different values of w and F ,

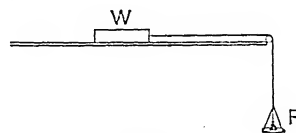


FIG. 2.

and plotting (see GRAPHICAL METHODS) the results on squared paper, μ may be found. If the plane be tilted through an angle ϕ (Fig. 3), so that sliding just takes place, then by the triangle of forces $\mu = \tan \phi$, and this also gives μ . The value of μ when sliding is just about to commence

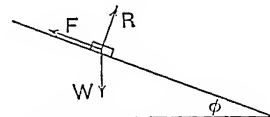


FIG. 3.

is greater than when sliding is taking place: the former is sometimes called the coefficient of limiting or static friction, and the latter that of kinetic friction. The laws of fluid friction are very different from these.

COMPARISON OF THE LAWS OF SOLID AND FLUID FRICTION (Perry).

Solid.

1. The force of friction is not much affected by the velocity, but is very small at low speeds.
2. The force of friction is proportional to the total pressure between the two surfaces.
3. The force of friction is proportional to the areas of the surfaces in contact.
4. The force of friction depends to a great extent on the nature of the surfaces in contact.

Fluid.

1. The force of friction depends on the velocity, and is very small when speed is very low.
2. The force of friction is independent of the pressure.
3. The force of friction is proportional to the area of the wetted surface.
4. The force of friction is not greatly affected by the nature of the surfaces when the speeds are moderate.

Owing to this great difference, which shows the value of lubrication, it has been overlooked that all so-called solid friction is probably fluid friction taking place in the fluid (air or lubricant) which separates the surfaces. Professor O. Reynolds suggests that we must to some extent look to hydro-dynamics to explain the curious phenomena of solid friction. Flat plates unloaded have little friction, owing to the thick air film between them; load them heavily, and the air film is made thin, and sticking occurs, due probably partly to vacuum and partly to molecular attraction.

To minimize the effect of friction lubricants are used. Journals and collar bearings *slightly* lubricated, as with an oily pad, follow the laws of solid friction approximately. Pressure in the lubricant is very great where the journal most nearly approaches the step; so when running in one direction with very slight lubrication the lubricant gets squeezed out and carried from the place where it is most wanted, and the journal may seize at a comparatively low pressure. If, however, there be reversal or irregularity of motion, the lubricant keeps its place better, and higher pressures may be used, as in railway axles. With very good lubrication, as with an oil bath, the lubricant is constantly carried to where it is required, and heavy loads may be sustained without seizing, the laws of fluid friction being approximately followed.

The number of foot-pounds of work wasted or degraded into heat is the product of the frictional force in pounds and the distance through which rubbing occurs in feet. To minimize this in a journal, it should have the smallest diameter consistent with strength. In the flow of a fluid along a pipe the frictional loss of energy per pound is clv^2/m , where m is the hydraulic mean depth, or sectional area divided by wetted perimeter, l is the length, v the velocity, and c a frictional coefficient. (See *HYDRAULIC MACHINERY*.) The energy lost in a belt is partly due to slip, and partly to bending and unbending. In all cases the energy spent in overcoming friction is dissipated or rather degraded into heat.

When one body rolls upon another there is a frictional loss of energy; but there is little experimental knowledge on this subject. The loss is probably due to the strain in and viscosity of the material, and also to slipping at the surfaces in contact. The latter may be studied by considering the wave in front of a

heavy wheel rolling on an india-rubber surface. When the loads are not too heavy, there is a great saving by substituting rolling for sliding friction, as in ball bearings for cycles, the roller bearings for shafting, and the friction wheels in delicate instruments like Attwood's machine.

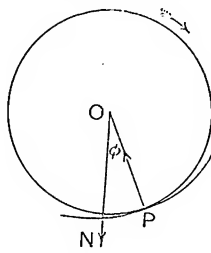


FIG. 4.

Let the direction in which a journal revolves be indicated by the arrow (Fig. 4); then it may be shown by the triangle of forces that the journal rides up in the step through the angle $\text{NOP} = \phi$ = angle of friction, so that $\tan \phi = \mu$, whence its value may be determined.

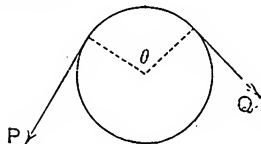


FIG. 5.

When a rope (Fig. 5) is passed round a rough cylindrical bitt (coefficient of friction μ , and embracing an angle θ radians), the tensions P and Q are given by the equation $Q = P e^{\mu \theta}$. (See *DYNAMICS*.) This shows that as the arc of contact is increased arithmetically Q is increased geometrically, and explains how a small pull at one end of a rope may balance a great force at the other end owing to the frictional forces called into play.

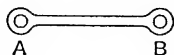


FIG. 6.

Tables of values of coefficients of friction are to be found in such books as Molesworth's *Pocket-Book of Engineering Formulae*; Trautwine's *Engineer's Pocket-Book*. For further information, consult Tait and Thomson's *Natural Philosophy*; Professor Perry's *Mechanics*; also 'The Cantor Lectures on Friction,' by Professor Hele-Shaw, *Journal Soc. Arts*, 1886, vol. xxxiii.

Friction Circle.—Let AB (Fig. 6)

be a link working on pins with friction. It is convenient to imagine the pins attached to one or other piece. Let a and b be the radii of the pins, α and β the coefficients of friction. Describe, concentric with the centres of the pins, circles of radii

$$\frac{a \cdot \alpha}{\sqrt{1 + \alpha^2}}, \quad \frac{b \cdot \beta}{\sqrt{1 + \beta^2}}$$

—i.e. $a \sin \phi_1$, $b \sin \phi_2$, where ϕ_1 , ϕ_2 are the friction angles. These are the friction circles, and the resultant stress along the link is a tangent to the two circles. Which of the tangents is to be taken depends on the nature of the problem; sometimes it may be easily determined, as in the case of the connecting rod of the steam-engine. For friction gearing, see *BELT AND ROPE GEARING*.

Friction Rollers, cylindrical or conical rollers, usually of hard steel, placed under a body so that it may roll instead of slide, rolling being easier than sliding in most cases. Friction wheels are used similarly, in which case a journal may be supported on friction wheels, as in Attwood's machine, instead of running in ordinary bearings; this is much more efficient. Bearings are sometimes made so that the journal, instead of working in brasses, is surrounded by and runs on friction rollers. They are said to effect a great saving of power in lines of shafting in mills. Ball bearings in cycles are of a similar nature.

Frictional Machines. See *ELECTROSTATIC MACHINES*.

Friday, the sixth day of the week, which among Germanic peoples was sacred to the goddess-mother Frigg, wife of Odin. Friday having been the day of the Crucifixion, is kept as a weekly fast day in the Roman Catholic Church, Good Friday or Long Friday being the day of the annual commemoration of that event. On this account also, Friday is looked upon as an unlucky day in all Christian countries. Friday being also the day of Adam's creation, is kept by Mohammedans as their weekly day of prayer.

Frideswide, or **FREDESWITHA**, St. (d. 735?), patroness of Oxford, was a daughter of King Didanus. Refusing marriage with King Algar, she founded a nunnery on the site where Christ Church cathedral stands. Her day is October 19.

Friedek, tn., Austrian Silesia, 14 m. s.w. of Teschen, has manufactures of linens, iron, and steel. There are mineral baths, and an old parish church to which pilgrimages are made. Pop. (1900) 9,023.

Friedland. (1.) Town, Bohemia, at N. foot of Isergebirge, 16 m. N. of Reichenberg, with textile manufactures and lignite-mining. Its castle contains memorials of Wallenstein, who in 1623 was created Duke of Friedland. Pop. (1900) 6,229. (2.) Town, E. Prussia, 26 m. S.E. of Königsberg, scene of the defeat of the Russians and Prussians by Napoleon on June 14, 1807. Pop. (1900) 2,824. (3.) Town, Mecklenburg-Strelitz, Germany, 43 m. N.W. of Stettin. Pop. (1900) 7,175.

Friedland, VALENTIN (1490-1556), German pedagogue, usually known as Trotzendorf, from his birthplace in Upper Lusatia. At Goldberg in Silesia he started a school (1531), which before his death attained a European reputation. Organized on the principle of the Roman republic, with Friedland as *dictator perpetuus*, the maintenance of discipline was largely in the boys' own hands. Latin was the sole language employed. See *Lives* by Löschke (1856) and Sturm (1889).

Friedländer, MICHAEL (1833), principal of the Jews' College, London, was born at Jutroschin in Prussia. From 1862 to 1865 he was director of the institute for teaching the Talmud at Berlin. Among other works he has published *The Commentary of Ibn Ezra on Isaiah*, *Text-book of the Jewish Religion*, Spinoza (1887), and translated *The Guide of the Perplexed* of Maimonides.

Friedrich, JOHANNES (1836), German theologian, was born at Poxdorf in Upper Franconia. He was appointed professor of theology at Munich in 1865, and in 1882 was transferred to the philosophical faculty. He attended the Vatican Council in 1870, and, in conjunction with Dr. Döllinger, headed the protest against the infallibility of the Pope. At a congress at Cologne in 1872, Friedrich declared the protesting party (called the Old Catholics) to be combating the whole papal system. His works include *Geschichte des Vatikanischen Konzils* (1877-87), *Das Papsttum* (1892), *Johann Adam Möller der Symboliker* (1894), and *Jacob Froschammer* (1896).

Friedrichroda, tn. and summer resort, Germany, in grand-duchy of Saxe-Coburg-Gotha, is the most popular holiday place in Thuringia, 13 m. by rail S.W. of Gotha. Pop. (1900) 4,396.

Friedrichshafen, port and bathing resort of Württemberg, on the E. shore of the Lake of Constance. It owes its foundation, about 1825, to King Frederick of Württemberg. Pop. (1900) 4,627.

Friedrichshagen, tn., Prussia, prov. Brandenburg, stands on the Spree, 9 m. by rail S.E. of Berlin. Pop. (1900) 11,283.

Friedrichsruhe, vil., Prussia, in the prov. of Schleswig-Holstein, 16 m. by rail E. of Hamburg. In the castle Prince Bismarck died in 1898.

Friedrichsthal, large vil., Prussia, prov. Rhineland, 7 m. by rail N.E. of Saarbrücken, with iron and coal mines and glass factories. Pop. (1900) 10,109.

Friedrich von Hausen, German minnesinger, who served Henry VI. and Frederick I.; and joined the crusade of 1189, dying in 1190 at Philomelium in Asia Minor.

Friedrich - Wilhelmshafen, harbour, Astrolabe Bay, on N.E. coast of Kaiser Wilhelmsland, New Guinea. It is the commercial capital of the colony.

Friendly Is. See TONGA Is.

Friendly Societies. Under a variety of names—e.g. Manchester Unity of Oddfellows, Ancient Order of Foresters, Rechabites, Free Gardeners, Druids, Shepherds, etc.—societies for mutual aid have long been established. The main purposes of friendly societies are: (1) Relief in sickness, known as 'aliment'; (2) payment of a sum at death, called 'funeral money' (for which purpose alone some societies are formed, under the name of funeral and burial societies); and (3) superannuation allowance, or old-age pension. Some societies have other objects, such as insuring against the loss of trade tools by fire or of cattle by disease.

Relief in sickness of a member or his dependants (the primary object) is bestowed either by payment of a weekly allowance (the amount depending on the duration of illness) or by providing medical attendance. It is now customary to charge either a uniform contribution irrespective of age (an entrance fee depending on the age at entry being charged in addition), or a contribution payable periodically during membership, the rate of which depends on the age at entry. The last is undoubtedly preferable. In the early years of membership the contributions are more than sufficient to meet the current claims and expenses, and the balance, invested at interest, forms a reserve fund. The rates charged depend on the scale of benefits and the occupation of members, and are matters of actuarial computation. Various tables of these (referred to later) having been compiled from the 'experience' of societies in the past, the contribution payable is arrived at by equating the present values of the benefits to be granted and the contributions to be received, found by discounting at interest and probability of survival the probable amount which will be payable at each

age. To the rates so deduced an addition is made to cover management expenses. To guard against persons entering when in bad health, and so becoming an immediate burden on the society's funds, applicants undergo medical examination, or appear before the committee of management and tender a statement of their personal health history. As a further precaution, the benefits are usually not allowed until after the expiry of a probationary period—say a year after enrolment.

Generally membership is small, and confined to particular localities or trades. In some societies, however, membership is large, and is distributed over the whole kingdom. Collectors are employed by these to collect the contributions week by week, and to canvass for new members. In large societies branches are formed in districts by members, which administer the local affairs, the branches being under the control of a central body and contributing to its funds. Such societies are known as 'affiliated societies' or orders; and some have branches in the colonies.

The friendly society system is extensive throughout the continents of Europe and America, but in most cases government control is carried out more extensively than in Britain, especially in Germany, where legislation has made insurance against invalidity and old age compulsory. As regards the United Kingdom, the system as it now exists dates from the beginning of the 18th century (although one society at Borrowstounness dates back to 1634). By Sir George Rose's Act of 1793 aid was given to new societies, in the form of safeguards as to management and supervision. In 1795 this act was extended to then existing societies. A registry office, which was instituted subordinate to the Treasury, publishes model rules, forms of accounts, etc., and collects the various returns required under the Friendly Societies Act, 1896—the act now in force, and which consolidated the law relating to friendly societies. The Treasury appoints public valuers and auditors, and determines the rates of remuneration for their services. The office of registrar was instituted in 1846, but practically dates from 1829.

It is purely voluntary on the part of a society to register, and excepting trades unions, any society can obtain incorporation under the Companies Acts. There are certain benefits arising therefrom, such as:—A society can carry on legal proceedings, and hold land and other property in

the names of trustees—such property, in most cases, passing from one trustee to another by the mere fact of their appointment. A preferential claim exists in the case of death or bankruptcy of an officer in respect of the society's property in his possession. A society can admit members under twenty-one and take binding receipts from them (or, while under sixteen, from their parents) which would otherwise be ineffective. Higher rates of interest are allowed by the National Debt Commissioners. No income tax is payable unless annuities are granted for more than £30 per annum. Members have privileges in insuring sums to cover funeral expenses of near relations; such insurances in unregistered societies would, in most cases, be void.

The principal conditions to which a registered society must conform are:—The rules, containing various provisions devised by the Treasury in the interests of members, must be certified by the registrar. The accounts must be audited at least annually, and returns made to the registry office; and every five years a valuation is required. The employment of public auditors and valuers is optional. Annuities must not exceed £50 per annum; and the maximum amount which can be assured is £200 in the case of a member, and £10 in the case of a child (£5 under age five).

At Dec. 31, 1904, there were 29,543 registered societies, with 13,414,182 members, and funds of £47,666,118.

Valuable statistical information relating to sickness and mortality has been collected by the registry office. Several analyses of the experience have been made, resulting in the publication of the following tables:—

NEISON—the returns from 1836–1840.

FINLAYSON—1846–1850.

W. SUTTON—1856–1880.

The last were published in 1896. The Manchester Unity of Odd-fellows has made four investigations. The last (1903), embracing the experience for 1893–7, along with the government tables of 1896, contains the most complete information on sickness rates published. The facts are arranged in several subdivisions, according to geographical situation and occupation. Several societies have also published their own experiences. Others which may be referred to are those of the Highland Society, 1824 (the first on the subject); Mr. Charles Ansell, 1835; and the Ancient Order of Foresters, 1873.

The following table shows the number of weeks of sickness in

a year at decennial ages, according to various tables:—

Age.	Highland Society.	Ansell, 1835.	Manchester Unity, 1903.	Ancient Order of Foresters.	Government (Males), 1876–80.	Government (Females).
20	575	776	901	845	887	1010
30	621	861	1007	906	957	1219
40	758	1111	1449	1272	1368	1744
50	1361	1701	2384	1953	2178	2425
60	2346	3292	5128	3871	4321	3492
70	10701	11793	14617	10371	12238	12418

The following publications may also be referred to: Walford's *Insurance Encyclopedia* (1871–80); *Reports of Royal Commission appointed in 1870 to inquire into the Law relating to Friendly Societies*; F. G. P. Neison's *Vital Statistics* (3rd ed. 1887); and G. F. Hardy's *Essay on Friendly Societies*.

FRIENDS, SOCIETY OF. The rise of the Society of Friends was the result of the preaching of George Fox in the middle of the 17th century. He taught that there was a direct divine revelation or 'inward light' given to every man, and that religion, therefore, was primarily a matter of individual conviction and experience. From this fundamental principle arose most of the distinctive views and practices of Fox and his followers. They insisted on the need of spiritual insight for the right understanding and use of the Scriptures. They held that the sacraments of baptism and the Lord's Supper were not essential; that there was no need of a ritual or of an ordained ministry; that women as well as men should be free to exercise the gift of preaching; and that silence was the fittest basis of public worship. They held also that war was incompatible with the spirit of Christianity, and refused to take oaths on the ground that all swearing was forbidden by Christ. They laid stress on the need of upright conduct and simplicity of life, and the application of the principles of religion to practical affairs.

Fox and his followers at first called themselves 'Children of the Light.' They soon, however, adopted the name of 'Friends,' and were also commonly known as 'Quakers.' Their numbers increased rapidly, and it is estimated that in 1680 there were at least 40,000 members of the society in England and Wales. Although Fox had originally no intention of founding a sect, he recognized the necessity of organizing the body which his preaching had brought into being. He therefore established a system of church government which, with

certain additions, has continued to the present day. About the

year 1666 the society was joined by Robert Barclay, and in 1668 by William Penn; and in their writings the distinctive views of the Friends found expression in a scholarly form.

The missionary zeal of the early Friends took them to many countries; and Fox himself travelled in America and the W. Indies, and also in Germany and Holland. In 1681 William Penn obtained from Charles II. a grant of the colony of Pennsylvania, in which he proposed to show that Quaker principles could be applied to political affairs. In the following year he sailed with his unarmed colonists, and signed his famous treaty with the Indians. This treaty was faithfully kept, and it is stated that no Quaker was ever killed by an Indian in Pennsylvania.

The views of the Friends brought them into collision with both Episcopalians and Puritans, and the prolonged controversies in which they engaged were often carried on in no measured terms. Until the end of James II.'s reign they were the victims of continual persecution. Many of them were imprisoned for travelling to their meetings on Sunday, for preaching in streets and markets, for not paying tithes, for testifying against 'hat-worship,' and for refusing to take oaths. After the restoration they suffered under the Conventicle Act and under a statute passed in 1662 to enforce the taking of oaths, and their refusal to take the oath of allegiance subjected them to the heavy penalties of *premunire*. It is estimated that by 1697, 16,735 Friends had been imprisoned and 152 transported, and that 370 had died in confinement or in consequence of their sufferings. James II.'s Declaration of Indulgence at length brought them a respite, and the era of persecution closed with the passing of the Toleration Act in 1689, and a statute enabling them to affirm instead of taking oaths in 1696. They still, however, remained, with other dissenters, under many disabilities, and were for long liable to imprisonment for non-payment of tithes.

The 18th century was a time of ease and outward prosperity in the history of the society. Debarred by their disabilities from political life, and by their principles from the military profession, the Friends mainly devoted themselves to commercial occupations and to philanthropic objects. They tended, however, to become exclusive, and declined in numbers. Nevertheless the period was not without its brighter features. John Woolman, an American Friend of singularly beautiful character, laboured for the liberation of the slaves, and the Friends, roused by his efforts, warmly supported the movement. By 1780 the society had freed itself from the reproach of slave-owning, and in 1783 it sent up the first petition to the House of Commons for the abolition of slavery. In the long struggle for emancipation that followed the Friends took a prominent part. They also supported many other philanthropic movements—such as the promotion of unsectarian religious education, the reform of prisons and lunatic asylums, and the mitigation of the penal code; and their devotion to objects of this kind is still one of their marked characteristics.

The first half of the 19th century witnessed a development of more 'evangelical' tendencies amongst the Friends. The missionary spirit revived; Sunday schools were opened; and in 1866 the Friends' Foreign Mission Association was established, which at the present time supports about a hundred missionaries in India, Madagascar, Syria, China, and Ceylon. Political and social changes, such as the removal of political disabilities and the throwing open of the universities to dissenters, have also influenced the character of the society. Friends began to take a more active part in public affairs; greater interest was shown in literature and art; the old exclusiveness disappeared; and peculiarities of dress and speech have been practically abandoned.

The society has no creed, but the theological views expressed in its official documents do not differ materially from those embodied in the Apostles' Creed. It contains, however, two distinct (though mutually tolerant) schools of thought, which may perhaps best be described as 'mystic' and 'evangelical.' The former aims at maintaining intact the principles of Quakerism with regard to the spiritual character of religion; the latter is especially concerned with mission work, and has less sympathy with 'broad' modes of thought in regard to Biblical criticism and questions of theology.

A devotional silence forms the basis of the society's meetings for worship; but any member of the congregation may, if impelled thereto by the Holy Spirit, deliver an address or offer prayer, and in some meetings it has become usual to read a passage of Scripture. In the 'mission' meetings held by the society its ordinary procedure is considerably modified, and the singing of hymns is allowed.

There are no paid or specially trained ministers, but Friends whose addresses are felt to be edifying are 'recorded' as ministers, as a recognition of their gifts. The duty of watching over the ministry is entrusted to 'elders,' who were first nominated in 1727; and the general oversight of the meeting is provided for by the appointment of 'overseers,' whose office dates from 1752. These three classes of officers hold special meetings for the consideration of their duties.

The separate congregations or 'particular meetings' are grouped into superior meetings known as 'monthly meetings,' which admit members, appoint officers, care for the poor, and act generally as the executive of the society. The 'monthly meetings' in turn are grouped into 'quarterly meetings,' and the nineteen 'quarterly meetings' of Great Britain and Australia constitute the London Yearly Meeting, which is the body of final authority. Members of the society may attend any of these meetings, but each subordinate meeting sends representatives to its superior meeting. The business of these meetings is conducted without formal resolutions or voting, the 'sense of the meeting' being ascertained and recorded by its clerk. The business of the London Yearly Meeting between its sessions is carried on by a standing committee known as the 'meeting for sufferings.' The organization of the society in Ireland and America is on similar lines. There are scattered congregations of Friends in other parts of the world.

In recent years the Friends have been actively engaged in carrying on 'adult schools' for men and women. These schools are conducted on unsectarian and often on very democratic lines, and are well attended, their membership at the present time being about 47,000. In these schools there is generally little attempt to proselytize, and the members do not, as a rule, join the society. The membership of Friends Sunday schools for children is about 23,000.

The Friends have been more successful in influencing those outside their society than in adding to their own numbers. The

present membership of the society in Great Britain, which is slowly increasing, is 18,466 (including members residing abroad); and in Ireland, 2,511. In America the 'orthodox' Friends probably number about 95,000, and the other bodies claiming to be Friends are estimated at about 24,000.

See *The Journal* (ed. 1902) and *Epistles of George Fox*; *George Fox*, an autobiography, edited by R. M. Jones (1904); Hodgkin's *The Life of George Fox* (1896); Barclay's *Apology* (1886); the *Works of William Penn* and Isaac Penington; the *Journal of Thomas Ellwood* (1714); John Woolman's *Journal* (ed. 1900); Besse's *The Sufferings of the Quakers* (1753); Sewel's *The History of the Society of Friends* (ed. 1834); Gurney's *The Distinguishing Views and Practices of the Society of Friends* (new ed. 1859); Barclay's *The Inner Life of the Religious Societies of the Commonwealth* (1878); C. E. Stephen's *Quaker Strongholds* (1891); Rowntree's *Quakerism, Past and Present*, and *The Society of Friends* (1901); Harvey's *Rise of the Quakers* (1905); *The Book of Discipline* (1906) of the society.

Friends of the People, a society called into being in 1792 by the French revolution. Its object was to secure parliamentary reforms not by agitation but by ordinary constitutional means. The society included Lords John Russell, Kinnaird, and Edward Fitzgerald, also Sir James Mackintosh, Dudley North, Erskine, and Sheridan.

Fries, ELIAS MAGNUS (1794-1878), Swedish botanist, born at Femsjö, Smaland. In 1824 he became professor of botany at Lund. Appointed to the professorship of practical economics at Upsala in 1834, he united with it that of botany after the death of Wahlenberg in 1851. He published numerous botanical works, including *Systema Mycologicum* (1821-32), and *Monographia Hymenomycetum Suecicæ* (1837-63).

Fries, JAKOB FRIEDRICH (1773-1843), German philosopher, born at Barby, near Magdeburg. In 1805 he was appointed professor of philosophy and mathematics at Heidelberg, but went to Jena in 1816, to occupy the chair of speculative philosophy. His philosophical standpoint differed from Kant's mainly in what he held to be the basis of philosophy—namely, psychology. His works include *Philosophische Rechtslehre* (1803); *System der Philosophie* (1804); *Neue Kritik der Vernunft* (1807); *System der Logik* (1811); *Julius und Evagoras*, a philosophical romance (1822); *Die Lehren der Liebe, des Glaubens und der Hoffnung* (1823); *Geschichte der Philosophie* (1837-40).

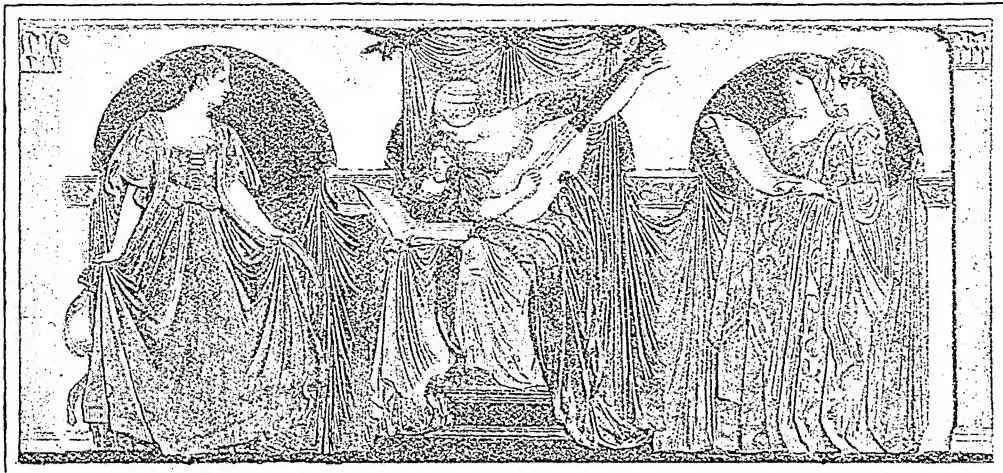
Friesland, prov. in the extreme N. of the Netherlands. The surface is only just above, in some parts even below, the level of the sea, and inundations have been relatively frequent. The province is famous for its horses, cattle, and sheep. Fishing is an important industry. Cap. Leeuwarden. Area, 1,282 sq. m. Pop. (1900) 340,262. See FRISIANS.

times of men and animals, illustrating some theme, oftentimes floral. Familiarly, in domestic architecture, the word frieze is applied to the band of decoration just below the cornice of an interior.

Frigate. Originally, the name was applied in the Mediterranean to a kind of long vessel navigated with sails and oars. In 1649 it

short, the beak elongated and strongly hooked, the legs short and feathered to the toes, the wings and forked tail elongated and pointed. The greater frigate-bird is about four feet in length, with a wide expanse of wing, and is brownish-black in colour, with metallic reflections, and a scarlet patch on the throat.

Frigga. See FREYJA.



Frieze in coloured Plaster: 'Music and the Dance,' by R. Anning Bell.

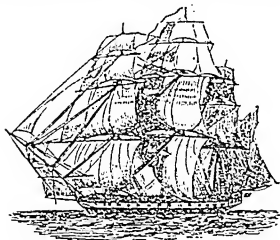
(By courtesy of the Studio.)

Frieze, strictly speaking, that part of the entablature of a building which forms a band between the architrave and the cornice, but more freely used to designate the decoration applied to that portion. The decoration varies with the order of architecture. In Doric examples it is divided into equal sections by raised portions with three angular flutes. The fluted sections are called *triglyphs*, the spaces between *metopes*. The metopes are sometimes left plain, and sometimes—as in the Parthenon—richly decorated. In Roman

was applied to a class of small fast-sailing ships built for the British navy. When the Seven Years' war broke out, the frigate class, as technically known, first came into existence, the first of the type being the *Southampton*, of thirty-two guns, built in 1757. These frigates were originally fast full-rigged vessels of from 600 to 700 tons burden, designed for scouting and cruising duties, and the essential feature in them was that they carried all their guns on a single deck. The size and armament were from time to time increased, and by 1815 some of them carried as many as fifty guns.

Frigate-bird, or **MAN-OF-WAR BIRD**, a member of the sub-order Steganopodes, and one of the swiftest and most active of marine birds. Truly pelagic in habit, it feeds entirely upon fish, and rarely comes to land except at the breeding season. The food is sometimes obtained at the surface of the water, but very frequently the frigate-birds compel other birds to disgorge their prey, and catch the falling fish before it reaches the water. The great frigate-bird (*Fregatus aquila*) is found in the warmer parts of the great oceans; the lesser (*F. minor*) is confined to the Indo-Pacific Ocean. The body is slender, the neck

Frilled Lizard (*Chlamydosaurus Kentii*), a very curious reptile found in Queensland and other parts of Australia, and belonging to the lizard family Agamidæ. It reaches a length of about thirty-two inches, and receives its name from the presence of a large expansion of the skin at either side of the neck, the two halves meeting at the throat. This frill is notched at the edge, has special supporting cartilages, and by means of



Frigate.

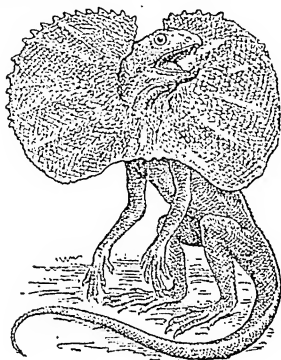
buildings the decoration frequently takes the form of ox-skulls and wreaths. When not so divided, the ornament often offers a continuous design, some-



Frigate-Bird.

muscles can be folded or expanded at will. The lizard walks upon its hind limbs like the extinct iguanodon, having the fore limbs hanging down. When at

bay, it expands the frill to its fullest extent, and opens the mouth wide, showing the powerful teeth—an attitude which possibly is of use in frightening some of its enemies. It inhabits sandy districts.



Frilled Lizard.

Fringe Tree, a hardy North American shrub, *Chionanthus virginica*, so called on account of its finely-segmented petals. It is a moisture-loving shrub, and given that condition, it is not difficult of cultivation. In May it bears abundant and graceful terminal racemes of fragrant white flowers. It is easily raised from imported seeds, or may be propagated by layers.

Fringillidae. See FINCH.

Frisians, a Germanic people (Frisii) who for close upon two thousand years and more have dwelt on the shores of the North Sea, between the Scheldt and the Elbe, and thence northwards as far as the coast of Jutland. They were subject to the Romans from the time of Drusus to about the end of the 1st century A.D. After a struggle of nearly two hundred years with the Franks, they were subjugated by Charlemagne. Christianity was introduced among them in the 7th century by Wilfrid, archbishop of York, and by Willibrord. In the antecedent heathen period their religious centre was the island of Heligoland. They were, and still are, a capable sea-faring race, and have always been animated by a strong instinct of freedom. Politically they never formed one united people, but were governed by a number of small chieftains; though in E. Friesland the dynasty of Cirk-sena ruled from 1430 to 1744. With the Angles and the Saxons bands of Frisians settled in England in the 5th century. The region which they inhabit may be briefly described as the crumbling fringe of the continent of Europe, and their annals are full of dramatic incidents connected

with their century-long struggles against the encroaching ocean. In this conflict the most memorable events have been the formation of the Zuider Zee by an irruption of the sea in 1282, the gradual formation of the Dollart during the 13th and 14th centuries, and the destruction of the former island of Nordstrand by a terrific gale in 1634. But the sea has always gone on unceasingly breaking down the islands. For example, in the middle of the 13th century the N. Frisian islands alone were estimated to cover nearly 1,100 sq. m., an area reduced by the middle of the 19th century to less than 110 sq. m. On the other hand, the Frisians have as persistently reclaimed an equivalent to what the sea has engulfed. Since the middle of the 16th century close upon 150,000 acres have been thus restored to cultivation. The long chain of the Frisian islands—Texel, Vlieland, Terschelling, Ameland, Schiermonnikoog, Norderney, Pellworm, Amrum, Föhr, Sylt—are separated from the mainland by shallow mud-flats (*Watten* or *Wadden*), often dry at low water. They afford excellent grazing in summer. Norderney (immortalized by Heine), Sylt, and others are much visited for sea-bathing. See Eugen Traeger, *Die Halligen der Nordsee* (1892); C. P. Hansen, *Die Chronik der friesischen Uthlande* (1856); C. Jensen, *Vom Dünenstrand der Nordsee* (1901); and R. His, *Friesen im Mittelalter* (1901).

Frit (*Chlorops frit*), a small dipterous insect which is sometimes very injurious to cereals. It is less important than some other members of the same genus.

Frith. See FIRTH.

Frith, or **FIRTH**, JOHN (1503-33), English ecclesiastic, born at Westerham, Kent. In 1526, while at Oxford University, he was accused of heretical teaching and imprisoned. On his release (1528) he fled to Marburg, where he assisted Tyndale in his literary work. His own *Disputacyon of Purgatorie* appeared in 1531. Returning to England in 1532, he was arrested, convicted of heresy, and burnt at Smithfield.

Frith, WILLIAM POWELL (1819), English painter, born at Aldfield in Yorkshire. He was elected A.R.A. in 1845 and R.A. in 1853. His early pictures are chiefly in illustration of Shakespeare, Scott, Goldsmith, and Dickens, and characterized by the conventional mannerisms of early Victorian art; but in 1852 he realized his desire to reproduce contemporary life, and then began the series of works whose keen observation, humour, and dexterous treatment brought him wide popularity. His large canvases are crowded with

typical figures, carefully and accurately drawn, and grouped without confusion of effect, and are described by Ruskin as a cross between Leech and Wilkie. Among the most celebrated are *Rams-gate Sands* (1854), *The Derby Day* (1858), *The Railway Station* (1862), *The Marriage of the Prince of Wales* (1865), and *The Road to Ruin* (1878). See his *My Autobiography and Reminiscences* (1887-8).

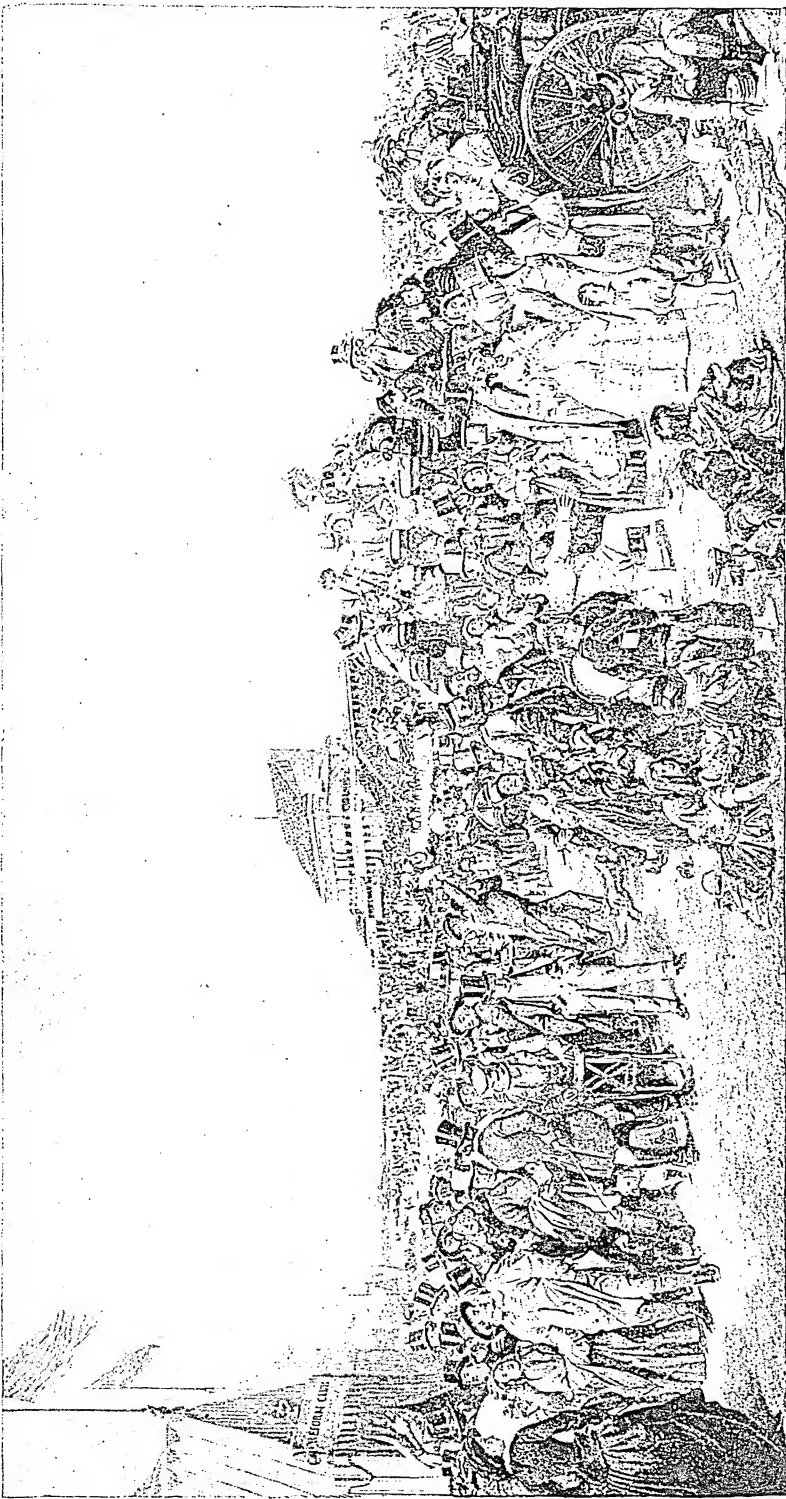
Fritillaria, a small free-swimming tunicate or sea-squirt, nearly related to Appendicularia.



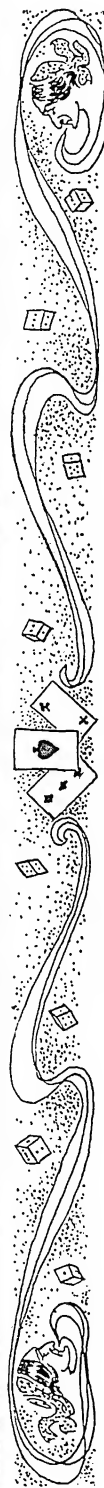
Fritillary (*F. meleagris*).

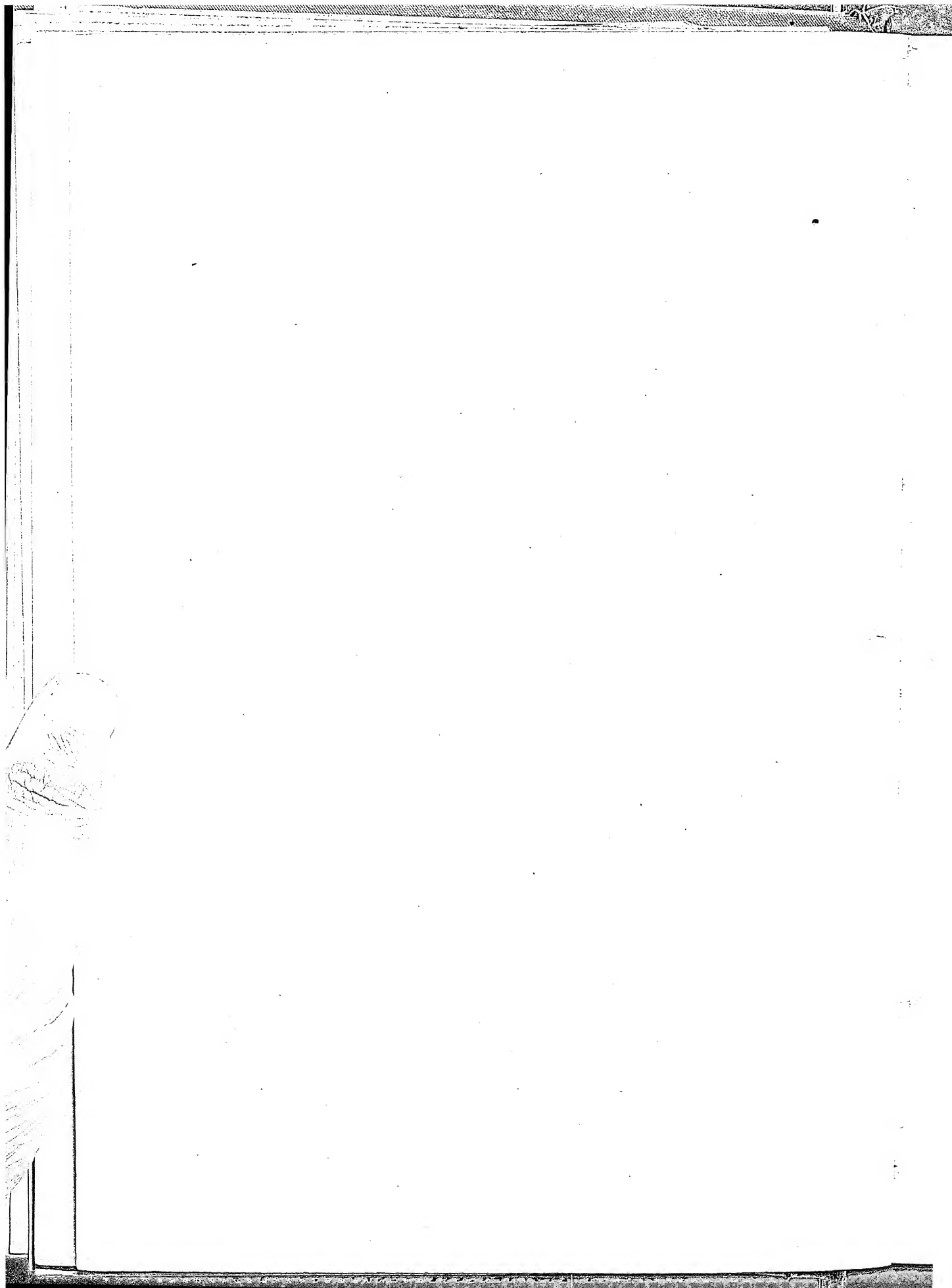
1. Stamens and pistil.

Fritillary, a genus of liliaceous plants, characterized by bearing solitary flowers, each with six petals, and a nectary to each petal. The common fritillary or snake's head of English meadows occurs only in certain districts in the east and south. It is a bulbous plant, with narrow leaves, and a curiously-checked, drooping, purplish flower which appears in spring. A stately fritillary is the crown imperial (*Fritillaria imperialis*), which thrives in a rich, deep, garden soil, or in a shrubby border, and grows upwards of four feet in April or May. There are varieties displaying various combinations of red, yellow, and orange. Most of the other fritillaries are dwarf bulbous plants, which thrive in rich, light soil, preferably in the partial shade of deciduous trees. The commoner kinds are very suitable for naturalization in grass or woodland. Most fritillaries produce sombre-coloured, curiously-checked, snaky-looking, pendulous flowers.



'The Derby Day.' A famous Picture by W. P. Frith, R.A.





Fritsch, GUSTAV THEODOR (1838), German naturalist and traveller, born at Kottbus. He visited Bechuanaland (1863-6), Egypt, Asia Minor, and the E. Mediterranean; was sent by the Prussian government to Aden (1868) to observe a total eclipse of the sun, and to Ispahan (1874) for the transit of Venus. Among his works are *Drei Jahre in Südafrika* (1868); *Die Eingeborenen Südafrikas* (1872); *Südafrika bis zum Zambesi* (1885); and *Die elektrischen Fische* (1887-90).

Friuli, dist., N. Italy, formerly an independent duchy which embraced the present provinces of Udine, part of Venice, and part of Görz and Gradisca.

F.R.M.S., Fellow of the Royal Microscopical Society.

F.R.Met.S., Fellow of the Royal Meteorological Society.

Froben, or **FROBENIUS, JOHANNES** (1400-1527), German printer and scholar, born at Hammelburg (Franconia); founded a printing-house at Basel in 1491. He first published an edition of the Scriptures in Latin, and of the New Testament in Greek, besides the works of the fathers. He was the first to introduce the Latin character into German printing; his work gained a high reputation for accuracy and artistic value, designs for titles, etc., being contributed by Holbein. See monograph by F. L. Hoffmann (1867).

Frobisher, or **FROBISHER, SIR MARTIN** (?1535-94), English navigator, was probably born in Yorkshire. He was the first Englishman to attempt a north-west passage to Cathay. After fifteen years of continued disappointment, he was helped by the Earl of Warwick and others to fit out three small craft, with which he started in June 1576. He returned to England on October 2. On May 31 following (1577) he again set out, and came back in September with an account of the discovery of ore near Hall's Island, in Frobisher Strait. In 1578 Frobisher started once more, and returned in October. In 1585 Frobisher sailed with Sir Francis Drake on the profitable expedition to the West Indies. In 1588 he distinguished himself against the Spanish Armada. He commanded a squadron two years later off the Spanish coast, and in 1594 he went to the aid of Henry IV. of France. During an assault on a fort near Brest he was mortally wounded, and died at Plymouth. See Jones's *Life of Frobisher* (1878) and Hakluyt Society's *Three Voyages of Frobisher* (1867).

Fröding, GUSTAV (1860), one of the ablest and most original of living Swedish poets, was born in Vermland, and (1887-96) em-

ployed on a Carlstad newspaper. Shortly afterwards his mental powers failed. He is essentially a lyric poet, his work being fresh, musical, condensed, yet instinct with strong feeling. His principal collections of poems are *Guitarr och Dragharmonika* (1891), *Nya Dikter* (1894), *Stänk och Flikar* (1895), *Räggler å Paschaser* (1895), and *Nytt och Gamalt* (1897).

Fröbel, FRIEDRICH WILHELM AUGUST (1782-1852), German educationist, born at Oberweissbach (Thuringia). From 1807 to 1809 he worked under Pestalozzi at



Friedrich W. A. Froebel.

Yverdon. In 1816 he established a small school at Griesheim, but transferred it after a time to Keilhau (both places in Thuringia). An attempt to introduce his system into Switzerland, in Lucerne, was frustrated by the opposition of the priests; but a training school for teachers at Burgdorf, in the canton of Bern, met with success. Realizing the importance of the training of children before the age of seven—a subject with which he deals in his *Menschenziehung*, vol. i. (1826)—Fröbel opened in 1837 the first kindergarten, at Blankenburg, near Keilhau. Devoting himself later to the training of women as teachers, his labours were interrupted by the edict of 1852, forbidding the establishment in Prussia of schools on the principles which he advocated.

The basis of the Fröbel system of education was development through voluntary activity; he held the object of all training to be the assistance of both mind

and body to develop along the lines of natural growth. Man being an organism must be treated as such, and hence perfection in the early stages will, granted a suitable environment, ensure corresponding perfection in the adult stage. It was to provide a suitable training for the early stage, hitherto generally neglected, that the kindergarten system was established. His works on education were edited by W. Lange (1850) and Seidel (1883). See *Life*, in German, by Hanschmann (1900); and Fröbel's *Autobiography* (Eng. trans. 9th ed. 1903).

Frog. The common British frog is *Rana temporaria* (the grass frog), which is smaller and less brightly coloured than the edible frog of the Continent (*R. esculenta*). The frog family (Ranidae) is defined by the presence of cylindrical processes on the single sacral vertebra, and by the nature of the shoulder girdle. In the sub-family Ranine, which includes the frogs in a narrow sense, there are no ribs, and the vertebrae are cupped in front and convex behind; teeth are present in the upper but not in the lower jaw. In the genus *Rana* the hind feet are webbed, but not the fore.

In spring the parents quit the holes in which they have passed the winter, and repair to slowly-moving or stagnant water. In the grass frog both sexes croak, but the sound is not loud, and there is nothing corresponding to the noisy 'concerts' in which the edible frog indulges. At the pairing season the male may be distinguished by a prominent swelling on the first finger. The eggs are laid in water, and are fertilized as they are laid. In the grass frog, the parents do not concern themselves about their eggs after these are once laid. In about a fortnight's time the larvæ wriggle from the jelly-envelope into the surrounding water. They are fishlike, without limbs, with external gills, and with a swimming tail. At first very inactive, these tadpoles soon begin to swim about freely, feeding on vegetable food or on refuse of various kinds; they soon lose their external gills, but acquire internal ones like those of a fish. Henceforth growth is rapid; hind limbs appear, and gradually increase in size, and the tadpole, especially if the water be foul, comes to the surface to breathe, showing that lungs are developing. About three months after hatching, the fore limbs, which have been concealed within the gill-chambers, are suddenly revealed, the tadpole ceases to feed, its tail gradually diminishes in size, and finally, the metamorphosis complete, it

hops on shore as a tiny frog. After quitting the water the little frogs spend the remainder of the warm season on land, before beginning hibernation in the autumn.

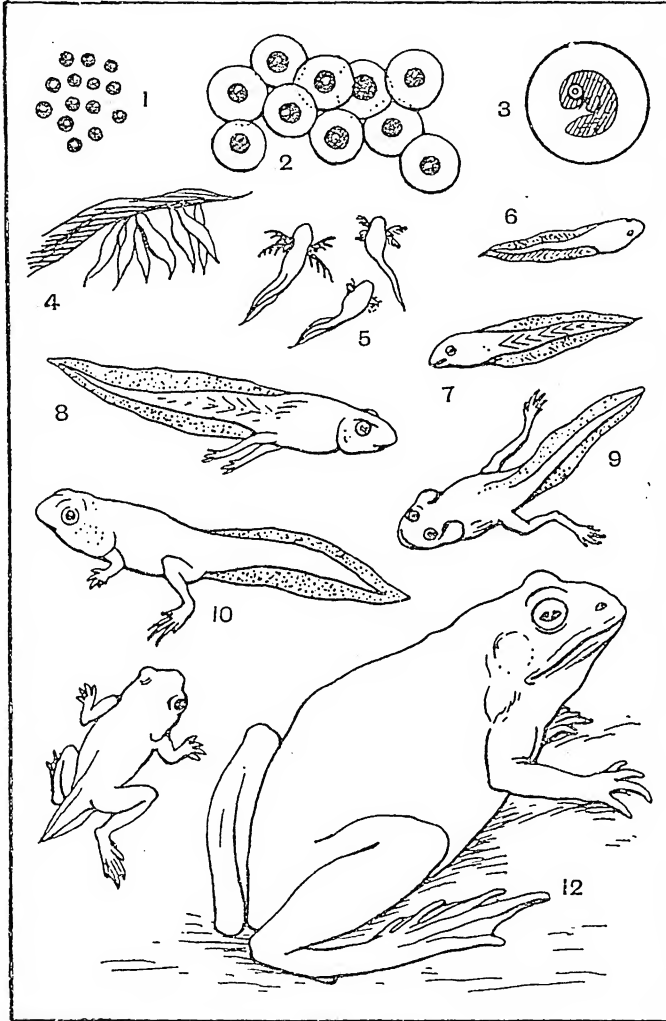
The grass frog, though it swims well and swiftly, is habitually terrestrial, spending most of its

withdrawn enclosing the struggling insect. The grass frog is widely distributed, stretching right across Europe and Central Asia; the edible frog accompanies it throughout most of this region, but is only present in England in certain of the eastern counties. Both species are eaten

from Borneo and the Philippines, which has the webs of the fingers and toes so expanded as to form parachutes, and is apparently capable of taking 'flying jumps.' In an allied species (*R. Reinwardti*) there is a fringe on the forearm, in addition to the expanded webs, which suggests the beginning of a flying membrane. See AMPHIBIA.

The common frogs have for a long period been used for dissecting purposes, in order to acquaint students with the outlines of vertebrate anatomy. They furnish also the material for many physiological experiments. See Mivart's *Frog* (Nature Series, 1873), and Marshall's *Frog* (1900).

Frogbit (*Hydrocharis morsus-ranæ*), a floating plant, occasionally to be found in ponds in Britain, belonging to the order Hydrocharidaceæ. It has heart-shaped or kidney-shaped leaves, and bears white flowers in late summer, male and female flowers occurring on different plants. It is a monocotyledonous plant, and has three sepals and three petals.



Development of Frog.

1, Eggs before leaving the ovary; 2, eggs shortly after laying; 3, tadpole before hatching; 4, tadpoles just hatched; 5, tadpoles with external gills; 6, 7, tadpoles with opercular folds; 8, 9, tadpoles with developing hind legs; 10, tadpole during metamorphosis; 11, young frog with tail not completely absorbed; 12, mature frog (*Rana esculenta*).

time on land in moist situations, and feeding on insects. The edible frog, on the other hand, is aquatic, finding a congenial home in ponds and marshes. Both frogs obtain their prey by means of their mobile tongues, which are shot out with great dexterity, and

on the Continent, though not in Britain, and both have a great number of enemies, the stork especially consuming a large amount of frogs.

Among allies of the frog, mention should be made of the curious flying frog (*Rhacophorus pardalis*)



Frog-hopper and 'cuckoo-spit.'

Frog-hopper, a popular name given to certain insects belonging to the order Hemiptera and the family Cercopidæ. The common frog-hopper is *Aphrophora spumaria*, a small gray insect about a quarter of an inch long, with four similar wings. They feed upon the juices of plants, and form the frothy substance known as frog-spit, or 'cuckoo-spit;' hence also the name of 'froth-fly.' Within these lumps of white froth lies the small white larva with its prominent black eyes. As the name indicates, the adults are capable of active jumping movements. The myth of the connection between the froth of the larva and the frog or cuckoo is as old as Aristotle, and is common on the Continent as well as in Britain.

Frogmore. See WINDSOR CASTLE.

Frogmouth, a name applied to the members of the family Podargidæ, which includes some

curious wide-mouthed birds, usually placed near the goatsuckers or night-jars, and also the oil-bird of S. America. The frogmouths range from India to Australia. Examples are *Batrachostomus auritus*, the eared frogmouth of the Malayan region, and the owl frogmouth (*Egotheles novae-hollandiae*) of Australia. All the frogmouths have mottled plumage like the night-jars, but either build nests or lay their eggs in hollow trees.

Frohschammer, JAKOB (1821-93), German theologian and philosopher, born at Illkofen, near Ratisbon. In 1850 was published his first book, *Beiträge zur Kirchengeschichte*, which was placed on the 'Index Expurgatorius.' In 1855 he became professor of philosophy at Munich. In 1861 he published *Ueber die Freiheit der Wissenschaft*, in which he upheld the independence of science from theological control. Next year he founded the *Athenäum*, the organ of Liberal Catholicism, but refused to join forces with Döllinger and the Old Catholic movement. In it he wrote the first adequate account, in German, of the theory of natural selection. He was excommunicated in 1871, and replied by three pamphlets (in Eng. as the *Romance of Romanism*, 1878). His other principal works are *Die Philosophie als Idealwissenschaft und System* (1884) and *System der Philosophie im Umriss* (1892).

Frohsdorf, vil., Lower Austria, on river Leitha, 30 m. s. of Vienna. Its castle was the residence of the Duchess of Angoulême after 1844, and later became the headquarters of the French Legitimist party.

Froissart, JEAN (1337-1410?), chronicler, was born at Valenciennes. At the age of eighteen he went to England, where he spent a year under the patronage of Philippa of Hainault, his countrywoman. At the age of twenty he began to write his history; and having completed the first section, he began his travels. Returning to England (1361 till 1366), he made an excursion into Scotland about 1364. Froissart accompanied the Black Prince to Dax, and the Duke of Clarence to his marriage at Milan. He was appointed in 1369 to the cure of Lestines. In 1386 he once more visited England. In 1372 he began to write his famous *Chroniques*, which describe events in Western Europe from 1326 to 1400. It is not reliable from a historical point of view, but it presents a picture of the time which is unrivalled in its vivid colour and its charm. The editions by Buchon (1824) and S. Luce (1869-93) are good. The English translation by Johnes

(1873) is generally used; Henry Newbolt has published (1900) the portions dealing with Britain. See Madame Darmesteter-Robinson's *Froissart* (Eng. trans. 1895); article by Sir Walter Scott, *Edin. Rev.*, Jan. 1805; and Kervyn de Lettenhove's *Froissart* (1858).

Frome, or **FROME SELWOOD**, mkt. tn. on the Frome R., 12 m. s. of Bath, Somerset, England. The woollen trade, for long the staple industry, is declining. Art metal works now take the first place. Pop. (1901) 11,055.

Fromentin, EUGÈNE (1820-76), French painter and writer, born in La Rochelle. His first inclination towards art showed itself in 1840. The pictures of Marilhat, exhibited in 1844, inspired him with a passion for the East, and in 1846 he made his first visit to Algiers. His earliest Salon pictures were two Algerian sketches and a French landscape in 1847; and after a second and third visit to Algiers he published his impressions, in *Une Année dans le Sahel* (1859; new ed. 1888) and *L'Été dans la Sahara* (1857; new ed. 1888). His *Maîtres d'Autrefois*, a subtle critical study of the Dutch and Flemish painters, was not published until 1876. His paintings have definite personal charm and vivid delicate effects of colour and of atmosphere, but are less scientific than the work of his noted confrères. He was an acute critic of the technique of painting, and shows keen observation and study of the effect of sunlight on colour. See Louis Gonse's *Eugène Fromentin* (1881).

Fronde is the name applied to the so-called leaves of ferns; but it is the scales on the fronds that are really the leaves. Functionally, however, the fronds serve as leaves; but they also produce sporangia containing spores. See **FERN**.

Fronde, a general name for the party or parties in France which were hostile (1648-53) to the rule of Mazarin during the minority of Louis XIV. The first leaders of the party were the parlements (courts of law), especially the Parlement of Paris. But their forces were defeated by the Prince of Condé, acting for the court party, at Charenton (1649). Condé, however, quarrelled with Mazarin, who arrested Condé, his brother Conti, and brother-in-law Longueville. This roused the nobles generally. Mazarin, after releasing Condé, Conti, and Longueville, withdrew into exile (Feb. 1651). Then Louis XIV. came of age, recalled (Dec. 1651) Mazarin, and put his forces under the command of Turenne, who defeated Condé just outside Paris (1652). This

led to the final victory of the court party and of Mazarin. See Fitzpatrick's *Great Condé and the Period of the Fronde* (ed. 1874); Sainte-Aulaire's *Histoire de la Fronde* (ed. 1860); and Chéruel's *Histoire de France sous le Ministère de Mazarin* (3 vols. 1882).

Frontenac, LOUIS DE BUADE, COMTE DE (1620-98), succeeded Courcelles as governor-general of Canada in 1672, holding the office until 1682, and again from 1689 to 1698. His severity to the settlers of New England and the Iroquois tribe became proverbial. See Parkman's *Count Frontenac and New France* (1877).

Frontinus, SEPTIMIUS JULIUS, praetor of the city of Rome in 70 A.D., and governor of Britain from 75 to 78 A.D., during which period he conquered the Silures. In 97 he was appointed superintendent of the aqueducts; he was also an augur. He died about 106 A.D. He wrote a work on the art of war, edited by Gundermann (1888; Eng. trans. by Richard Moysine, 1839).

Fronto, M. CORNELIUS, Roman rhetorician of the 2nd century A.D., tutor of Marcus Aurelius and Lucius Verus; became senator, and consul in 143. Of his works, only a feeble treatise *On the Differences of Words*, and a number of letters addressed chiefly to Antoninus Pius and Marcus Aurelius, are extant. Editions: Niebuhr (1816) and Mai (1823).

Frosinone, tn., Italy, prov. Rome, 53 m. by rail S.E. of Rome. It has some trade in wine. Pop. (1901) 11,029.

Frost. When the temperature of the air falls to 32°, or freezing-point, there is said to be a frost. Should the dew-point (see DEW) be below 32°, hoar frost instead of dew is deposited on the ground. Severe frosts in the British Islands during the winter are brought about either by the presence of a large anticyclone (area of high barometric pressure), or by a low-pressure area to the south-west, with a high-pressure area to the north or east. The great frost of 1860 was occasioned by an area of high barometric pressure over W. Asia, where the barometer read 30.7 in. and more, steadily diminishing westwards to 29.7 in. in the British Isles, and to a still lower point over the adjacent portions of the Atlantic. Under these conditions of pressure the cold heavy dry air of Russia and Siberia was drawn over Great Britain and W. Europe. The lowest temperatures recorded during this frost in a thermometer screen placed at the standard height of four feet above grass were -12° F., or 44° of frost, at Braemar

on December 24, and at Castle Newe in Aberdeenshire on December 25. See Dr. Buchan, in *Quar. Rept. of the Met. Soc. Scot.*, 1861, p. 6.

The great frost of 1890-1, which was severely felt over England, but not to any marked extent in Scotland or Ireland, was occasioned by a large and constant area of high barometric pressure over Europe. Cyclonic disturbances from the Atlantic could not effect a passage into Europe owing to the high pressure there; but both Ireland and Scotland came under the warming influence of the westerly and south-westerly winds, due to the depressions out in the Atlantic. See G. C. Harding, in *Quar. Jour. Roy. Met. Soc.*, xvii, p. 93.

During December 1890, when the frost over England was most intense, Edinburgh enjoyed a mean temperature no less than 61° F. higher than London. This was the greatest inversion of temperature observed between the two places in any month since the records commenced in 1764, and this anomaly of temperature conditions prevailed to a greater or less degree during January and February 1891. See R. C. Mossman, in *Jour. Scot. Met. Soc.*, xi, p. 290 ff.

The severe frost of January and February 1895 was due to another type of pressure distribution, the British Isles being situated between an anticyclone, central over Scandinavia and Lapland, and a low pressure over the south of France, Spain, and the Mediterranean. In the fifteen days embraced in the period from Feb. 6 to 20, 1895, the mean temperature fell below the average as much as 21° F. at Braemar, and 19° F. at Stobo and Kingussie. At Braemar the thermometer fell below zero (i.e. 32° F. below the freezing-point) on nine occasions, the lowest of all being -17° F., or 49° of frost, on the 11th, which is the lowest temperature observed in the British Isles with a certified instrument exposed in a Stevenson screen. As in the frost of 1860, the increase of temperature with height was very marked, the lowest reading recorded on the summit of Ben Nevis (4,406 ft. above sea-level) being 1° F. on the 7th, or 19° F. higher than the lowest at Braemar. From the 17th to the 20th inversions of temperature were recorded, the temperature at 9 a.m. on the 19th being 17° F. higher on the summit than at the base of Ben Nevis, which was evidently in the midst of a current of air warmed dynamically in its descent from a greater height. This affords an explanation of the phenomenon known as the 'up-bank thaw,' which is fre-

quently observed during severe frosts, and is taken advantage of by sheep and other animals, who forsake the cold valleys for the comparative warmth of the heights. See Mossman, in *Jour. Scot. Met. Soc.*, x, p. 163; and Marriott and Brodie, in *Quar. Jour. Roy. Met. Soc.*, xxi, p. 141.

For particulars regarding the great frosts of history, see Andrews' *Famous Frosts and Frost-fairs* (1887); Baker's *Records of Seasons*; Lowe's *Natural Phenomena and Chronology of the Seasons* (1870); A. E. Watson, in *Quar. Jour. Roy. Met. Soc.*, xxvii, p. 141; Stow, in *Quar. Jour. Roy. Met. Soc.*, xvii, p. 176. See also FREEZING.

Frost-bite is the effect produced upon any exposed part of the body by prolonged cold much below freezing-point. A frost-bitten member becomes successively red, blue, and white, and loses all sensation; the local circulation of the blood ceases, and the tissues of the part affected die. If the frost-bite kills the part absolutely and at once, then later it drops off with dry gangrene. If partial recovery takes place, then moist gangrene may be the end of it.

Treatment.—When frost-bitten, the part must not be too suddenly heated, or inflammation will follow. It should rather be first stimulated by gentle rubbing with snow or cold water. Gradually the temperature of the water may be raised as the part regains its colour and sensitivity, and friction may be more vigorous. Later, the part should be well protected for some time with warm coverings.

Frost Figures. In the formation of snow-crystals or of ice on calm and free surfaces of water, the crystals are always straight, and join one another at an angle of 60°. Under some conditions, however, curved designs are produced. If frost succeeds a night's rain, patterns resembling arborescent tracery, with fronds two feet or more in length, are often formed upon smooth flagstones upon which a thin layer of mud has been deposited. Professor Mendola (*Nature*, Dec. 4, 1892) attributed the patterns formed to the rapid freezing and evaporation of the water in this surface layer of mud. Other authorities (Professor Bonney, *Nature*, Dec. 15, 1892) have noticed that the water appeared to have drawn the mud towards the groups of crystals, leaving the interstitial pavement partly cleared of sediment, the crystalline scrolls and fronds being the result of impeded or constrained crystallization. See SNOW and ICE; also Professor Bonney in *Nature*, Feb. 2, 1901.

Froth-fly. See FROG-HOPPER.

Froude, JAMES ANTHONY (1818-94), English historian and man of letters, born at Dartington, Devonshire. He was employed by Newman as one of the contributors to the *Lives of the Saints Series*, which was intended to revive interest in mediæval Christianity. Froude, however, imbibed sceptical ideas, and his heterodoxy became apparent when, in 1849, he published *The Nemesis of Faith*. He then became editor of *Fraser's Magazine* (1860). In 1856 appeared the first two volumes of his *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada*. The work, which extended to twelve volumes, was concluded in 1870. Its main feature is the attempt to present Henry VIII. in a new light. As a historian, Froude belongs to the literary, picturesque, and dramatic class. He has no sympathy with the scientific school, and is a follower of Carlyle in his belief in great men. His series of essays, published in four volumes under the title of *Short Studies on Great Subjects* (1867-83), display Froude at his best. On points of historic detail Froude is not exactly reliable; nor was impartiality one of his gifts. His *English in Ireland* (1872-4) has all the faults of his other works. In 1874 and 1875 he was in South Africa, and on his return he published, in 1880, *Two Lectures on South Africa*. From 1881 to 1884 Froude was engaged upon literary work in connection with his old friend and master Carlyle. He edited the *Reminiscences* (1881), *Mrs. Carlyle's Letters* (1883), and wrote the *Life of Carlyle* (1882), raising quite a storm by his unflattering portrait of Carlyle. The controversy was reopened by the publication of *My Relations with Carlyle* (1903), a work left by Froude defending his attitude towards the Carlyles. This was replied to by *The Nemesis of Froude*, by Sir James Crichton-Browne and Alexander Carlyle. Among the more important of Froude's later works were his *Life and Letters of Erasmus* (1894), and his *Lectures on the Council of Trent* (1896), delivered as professor of modern history at Oxford, where he succeeded (1892) Freeman; and *Oceana* (1886), an account of his Australasian tour. See Skelton's *Table-Talk of Shirley* (1895), and *Life*, by Herbert Paul (1905).

Froude, RICHARD HURRELL (1803-36), English divine, and elder brother of the above, one of the leaders of the Oxford Tractarian movement, was born at Dartington, Devonshire. Ordained priest in 1829, he be-

came associated with Newman and others in the Tractarian movement. Of *Tracts for the Times* he wrote three numbers. With Newman he wrote *Lyra Apostolica* (1832-3). His *Remains* were published in 1839, edited by J. B. Mozley. See L. I. Guiney's *Hurrell Froude* (1904).

Froude, WILLIAM (1810-79), English engineer and mathematician, brother of Richard and James Froude, was born at Dartington, Devonshire. He became assistant to Brunel (1837), but retired early from professional work to cultivate scientific researches, which included the dynamics of the flight of birds, and problems connected with the behaviour of ships—their rolling, resistance, and propulsion. His last work was the construction of a dynamometer for determining the power of marine engines. F.R.S., Fellow of the Royal Society.

F.R.S.E., Fellow of the Royal Society of Edinburgh.

F.R.S.L., Fellow of the Royal Society of Literature.

F.R.S.S.A., Fellow of the Royal Scottish Society of Arts.

Fructidor, the twelfth month in the French calendar inaugurated at the revolution. In the years I.-VII. it included August 18 to September 16, and in the five years following, August 19 to September 17.

Fructose, fruit sugar or levulose, $C_6H_{12}O_6$, occurs in sweet fruits and honey along with dextrose, with which it is also obtained on the inversion of cane sugar. It has been prepared synthetically, and is structurally a ketonic alcohol. It crystallizes with difficulty, rotates polarized light to the left, is fermentable by yeast, and reduces Fehling's solution.

Frugivora, or **FRUIT-EATING**, a term formerly applied to the large fruit bats, also called flying foxes and fox bats. The term is now abandoned.

Frugoni, CARLO INNOCENZIO MARIA (1692-1768), Italian poet, born at Genoa. In 1716 he became professor of rhetoric at Brescia, teaching later at Rome, Genoa, Bologna, and Modena. Released finally from his monastic vows by the Pope, he settled at the court of Parma. He was above all a lyrical poet, his verse being marked by elegance of language and wealth of imagery. He was also successful in Latin poetical epistles after Horace, and in Italian after Ariosto. His collected works were published at Lucca (1779).

Fruit, a term used to denote the fertilized ovary of a flowering plant, and whatever structure may be incorporated with it. At one time the name was confined to the fertilized ovary; this gave

rise to the inconvenience that in the case of the apple and pear, for example, it could signify only what in popular language is called the core. For the right understanding of any given fruit, a knowledge of the flower and of the process of fertilization, with its results, is necessary. The gynoecium, or female system of a plant, is apocarpous or syncarpous according as the ovary consists of a single carpel united at its margins (and in this case there are many ovaries), or of several carpels, which unite to form a single ovary, distinguished as plurilocular when the margins turn inward and divide it into compartments by walls or dissepiments, and as unilocular when the carpels cohere by their edges and do not turn inwards to form dissepiments. In the first case each separate carpel constitutes a distinct fruit; in the second the carpels are united to form a single fruit, and continue so until the product of their coalescence ripens and the seeds are dispersed. If an apple be cut transversely, the five locules containing seeds suggest that the pistil must have had five carpels, as examination of a flower in spring will prove to be the case. In the strawberry the fleshy receptacle is the popular 'fruit,' and the 'seeds' on the outside correspond, from a botanical point of view, to the core of the apple. Still greater complication may be seen in the fig, where the fleshy part is the receptacle, and the 'seeds' in the interior are the ripened ovaries of the pistillate flowers. The part of the fruit covering the seeds, whether consisting of the carpels alone, or with the receptacle superadded, is called the pericarp, or fruit-wall. Sometimes this is divided into distinct layers—which are called endocarp, mesocarp, and exocarp—from within outwards. The character of the ripe pericarp has been used as a criterion in distinguishing the different varieties of fruits. Many classifications have been put forward, but the following is one of the most simple:—

1. **Dry Dehiscent Fruit**.—The capsule consists of an aggregation of carpels separating when ripe by slits at the dissepiments (*septicidal dehiscence*), as in the gentian; along the midribs (*locucidal dehiscence*), as in the violet; or the seeds may escape through pores, as in the poppy. Other forms of the capsule are the follicle, consisting of a single carpel, dehiscing by the ventral suture, as in the peony; the legume, dehiscing by both sutures, as peas and beans; the silique, consisting of two carpels, with a middle partition, as the shep-

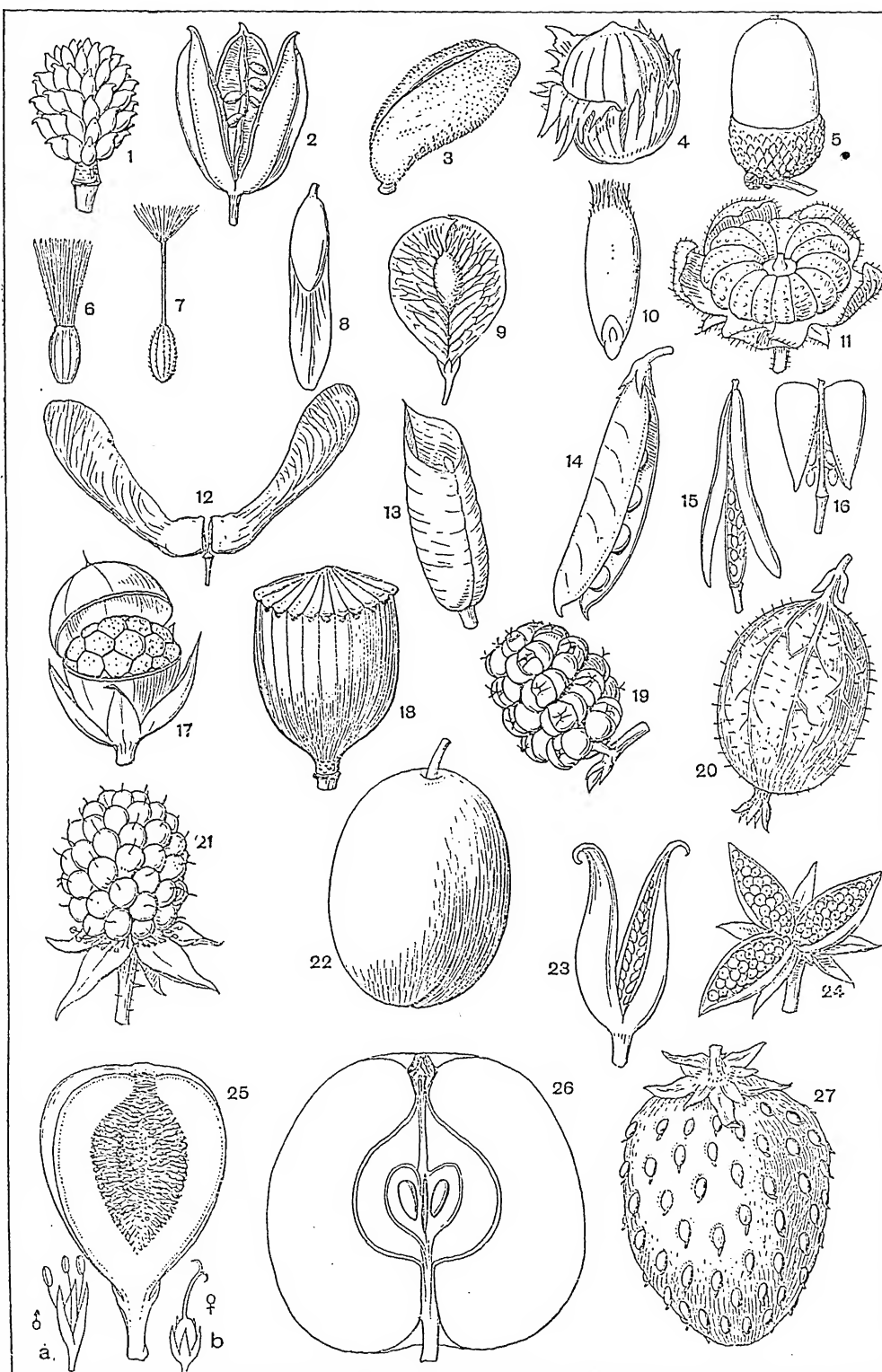
herd's purse; and the pyxidium, opening by a lidlike valve, as the pimperl.

2. **Dry Indehiscent Fruit**.—The nut has a dry pericarp, neither dehiscing nor breaking up when ripe, as the hazel nut. The fruit of grasses is a caryopsis; and of the Compositæ, an achene. The fruit of the Umbelliferae and of the mallow is called a schizocarp. It is many-chambered, but separates when ripe without dehiscence.

3. **Succulent Fruit**.—All these many forms may practically be reduced to two—the berry, such as the currant, the grape, and the apple; and the stone fruit or drupe, in which the seed is contained in a hard endocarp, as in the plum and walnut. But the walnut as a dessert fruit is comparable to the plum-stone, the exocarp or flesh having been removed.

Fruit Bat, a name applicable to all the members of the family Pteropodidae, also called flying foxes or fox bats, from the foxy-looking heads of the more typical forms. The members of this family are the largest of the bats, and are characterized by the fact that the index finger of the hand has three segments, instead of one or two as in the insect-eating bats, and is usually furnished with a claw; the ears are of small size; the tail, if present, is always short, and is placed beneath the membrane which connects the hind limbs; the stomach is more complex than in the insect-eating bats; the cheek teeth are not cusped, but have their crowns elongated and grooved, so as to fit them for their work of masticating fruit. To the genus *Pteropus* ('wing-foot') belong the fruit or fox bats of India, the islands of the Pacific and Indian Oceans, and Australia. The largest species is *P. edulis*, from the Malay Archipelago, which measures five feet from tip to tip of the wings. As the name indicates, it is eaten by the natives. The Indian form (*P. medius*) sometimes assembles in vast flocks, and commits great depredations in plantations. The bats are stated to be fond of palm-juice, and drink it from the pots in which it is collected, with the result that they become completely intoxicated. All the fruit bats are confined to the warm countries of the Old World. Other species are the short-nosed fruit bat of India (*Cynopterus marginatus*), remarkable for its great voracity; and the long-tongued fruit bat (*Caronycteris minima*) of the same region.

Fruit-farming, as distinct from market-gardening, consists in the cultivation of tree and bush fruit, and includes strawberries and tomatoes. Fruit-



Classification of Types of Fruit.

1. Apocarpous. 2. Syncarpous. 3. Achene. 4. Nut. 5. Glands. 6. Cypsel (inferior achene). 7. Same, stalked. 8. Key fruit of ash. 9. Elm. 10. Caryopsis. 11. Schizocarp (carcerule) of mallow. 12. Samara. 13. Follicle. 14. Legume. 15. Siliqua. 16. Silicle. 17. Pyxidium. 18. Capsule. 19. Sorosis (mulberry). 20. Berry. 21. Drupels. 22. Drupe. 23. Fruit of gentian. 24. Fruit of Viola. 25. Fig with male (♂) and female (♀) flowers. 26. Pome (apple). 27. Strawberry.

farming is necessarily restricted to good land and favourable sheltered situations. The increase in fruit-growing since 1880 is illustrated by the fact that, whereas in the year named some 180,000 acres were planted with fruit trees of all kinds, in 1905 the total amounted to 323,148 ac., of which 309,140 were in England. Kent is favourably situated for fruit-growing, and the area has increased from 14,645 ac. in 1880 to 51,354 ac. in 1905. The other counties which are famous for fruit are Devon, with 28,835 ac. of orchards and small fruit (25,758 in 1880); Gloucestershire, with 21,889 ac. (14,178 in 1880); Herefordshire, with 28,891 ac. (26,683 in 1880); Somerset, with 25,938 ac. (22,993 in 1880); Worcestershire, with 27,118 (15,854 in 1880).

Fruit cultivation is highly speculative. A full crop is not an unmixed advantage, and partial failure is often much more profitable on account of the enhanced value. The labour required is enormous, but large fortunes have been amassed by successful men. The principal varieties grown in the open air are—gooseberries, a good crop being 6,500 to 7,000 lbs. per acre. An average crop of red currants is from 4,500 to 5,200 lbs. per acre, sold at 13d. to 23d. per lb. The total expenses per acre of both gooseberry and red currant cultivation will be from £17 to £20. An average crop of black currants is about 2,800 lbs. per acre, sold at 3d. per lb. An average crop of raspberries is about 3,000 lbs. per acre, at 3d. per lb. = £37. 10s. An average crop of strawberries is 3,000 lbs. per acre, and an average price 6d. per lb. Frequently 5,000 lbs. per acre are grown. Filberts and cob-nuts will not bear for four or five years, and after eight years they will yield about an average of 8 cwt. per acre, and make from 7d. to 1s. 4d. per lb. Fruit-farming in the colonies and in foreign countries is conducted on an elaborate scale, and by the process of canning, as well as by sending fresh fruit and fruit preserved in refrigerating chambers, the produce reaches all parts of the world. The importation of foreign-grown fruits has increased rapidly within recent years, the principal imports in the years 1893 and 1905 being—apples to the value of £843,500 (1893) and £2,065,193 (1905); bananas (1900), £549,000 and £1,770,256; grapes, £530,500 and £761,632; plums, £331,600 and £524,673; oranges and lemons, £1,703,700 and £2,368,545. Tomatoes were imported to the value of £733,471 in 1901, and of £970,579 in 1905. The total value of fruit imported in 1905 was £12,645,920. Apples

are received from Canada, Australia, and Tasmania; grapes from the Continent, Channel Islands, Algeria, California, etc.; oranges and lemons reach us from the Mediterranean, Spain, Florida, and elsewhere; while bananas mostly come from the Canary Islands and Jamaica. Although the imports are so large, a profitable cultivation of fruit under glass has sprung up and enormously increased in recent years. Grapes and tomatoes are the principal crops; the average yield of the former approaches twelve and of the latter twenty tons per acre. On July 1, 1905, a report by a committee of the Board of Agriculture and Fisheries on the fruit industry of Great Britain was issued. Its chief recommendations were:—(1.) The establishment of a special sub-department of the Board of Agriculture to deal with the fruit industry, the starting of a bureau of information and of an experimental fruit farm, in connection with which practical training in fruit-growing would be given. (2.) The teaching of horticulture in public schools. (3.) Several amendments of the law in reference to compensation for improvements, tenancy, rates, etc., so far as concerns market gardeners and fruit-growers. (4.) Better railway facilities and reduced rates for carriage. (5.) Jam made wholly or partly from foreign fruit should be so labelled. (6.) Government inspection of imported fruit. (7.) That fruit-growers should pay more attention to the grading and packing of the better classes of fruit, and to the selection of the proper kind to plant according to soil, etc. (8.) The establishment of co-operative societies for distributive purposes and the securing a supply of labour. (9.) The keeping of bees as a subsidiary source of profit on fruit plantations. See APPLE, PEAR, PLUM, CHERRY, VINE, TOMATO; also STORING FRUIT. For full information, see the *Journal of the Royal Agricultural Society*, vols. xiv.-xxv. 2nd series.

Fruit Pigeons (*Carpophaginae*), a sub-family of pigeons, including large forms, which feed upon fruits; confined to the Old World, and occur chiefly in India and the Malay Archipelago, extending to New Zealand and Australia.

Fruementius, St. (c. 300-360 A.D.), was captured by the Abyssinians, converted that people to Christianity, and about 340 was consecrated bishop of Axum. He is said to have translated the Scriptures into Geez.

Fruntsberg, GEORG VON (1473-1528), leader of the Landsknechte (German free-lances) under Maximilian and Charles v.,

was born at Mindelheim in Swabia. Taking an important part in the wars in Italy and the Netherlands, Fruntsberg led his troops in twenty engagements, and was the hero of many valiant exploits, especially at Bicocca, near Milan (1522), and at Pavia (1525), and when with 1,800 men he stormed a pass well-nigh impregnable, and guarded by 9,000 Venetians. See Barthold's *Georg von Fruntsberg* (1833).

Fry, SIR EDWARD (1827), English judge, born at Bristol; was called to the bar in 1854, and made Q.C. in 1869. Appointed a judge of the High Court (1877), he became a lord justice of appeal (1883), and retired in 1892. He was nominated president of the Royal Commission on the Irish Land Acts (1897-8), was a member of the Historical Manuscripts Commission and of the Hague court of arbitration, and chairman of the Metropolis Water Act, 1902. He was instrumental in bringing into prominence the subject of secret commissions in trading operations. Sir Edward Fry was legal assessor to the International Commission on the North Sea incident. He is the author of *Specific Performance of Contracts* (1858; new ed. 1903), *British Mosses* (1892), and *Studies by the Way* (1900).

Fry, ELIZABETH (1780-1845), English philanthropist, was born at Norwich. In 1800 she married Joseph Fry, a London merchant. In 1811 she was recorded a 'minister' of the Society of Friends. In 1817 she formed the Association for the Improvement of the Female Prisoners in Newgate, and her success in ameliorating their condition aroused a widespread interest in the prison-reform movement. She visited prisons in England, Scotland, Ireland, and on the Continent, and her efforts resulted in many beneficial changes in prison management. See *Memoirs*, edited by her daughters (2 vols. 1847); and *Life* by S. Corder (1853).

Fry, FIRM OF, cocoa and chocolate makers, and distinguished members of the Society of Friends. JOSEPH FRY (1728-87), the first member of the family who settled in Bristol, was virtually the founder of the firm. In 1764 he also went into typefounding and into printing, and brought out a Bible in 5 vols. (1774), still known as 'Fry's Bible.'—EDMUND FRY (1754-1835), son of Joseph, carried on the typefounding and printing establishment until 1829, then devoted himself to the cocoa and chocolate business.—HENRY FRY (1756-1830), also a partner in the two enterprises, devoted more attention to the chocolate industry than to typefounding.

Fryxell, ANDERS (1795-1881), Swedish historian, born at Hesselkog (Dalsland); was ordained to the ministry in 1820, and in 1821 became *magister philosophus* at the University of Upsala. In 1828 he became rector of the Stockholm Gymnasium, and from 1835-47 pastor of Sunna in Vermland. In 1840 he was elected member of the Swedish Academy. He published *Handlingar rörande Sveriges Historien* (1836-43). His principal work is *Berättelser ur Svenska Historien*, in 46 vols. (1832-79), a history of Sweden from the earliest times to the death of Gustavus III.; partly translated into English (2 vols. 1844). Fryxell is also the author of the first systematic grammar of the Swedish language, *Svensk Språklära*, and of *Bidrag till Sveriges Litteraturhistoria*, in 9 vols. (1860-2).

F.S.A., Fellow of the Society of Antiquaries or of Arts.

F.S.S., Fellow of Statistical Society.

Fuad Pasha, MEHAMED (1814-69), Turkish statesman and author, born at Constantinople. He was appointed minister of foreign affairs (1832-4), and again in 1858. Appointed grand vizier in 1861 (till 1866), he became minister of foreign affairs a third time in 1867. His pamphlet on the holy sepulchres, *La Vérité sur la Question des Lieux Saints* (1853), was levelled against Russian claims.

Fuca, JUAN DE, STRAIT OF, connecting Puget Sound with the Pacific, on the N.W. coast of N. America, separating the mainland of Washington State from the island of Vancouver, British Columbia. It has an average width of 15 m., and is about 100 m. long. A boundary question between Great Britain and the United States, regarding the ownership of islands in the strait, was settled by arbitration in 1872.

Fucecchio, tn., Italy, prov. Florence, on the Arno, 23 m. W. of Florence. Pop. (1901) 12,581.

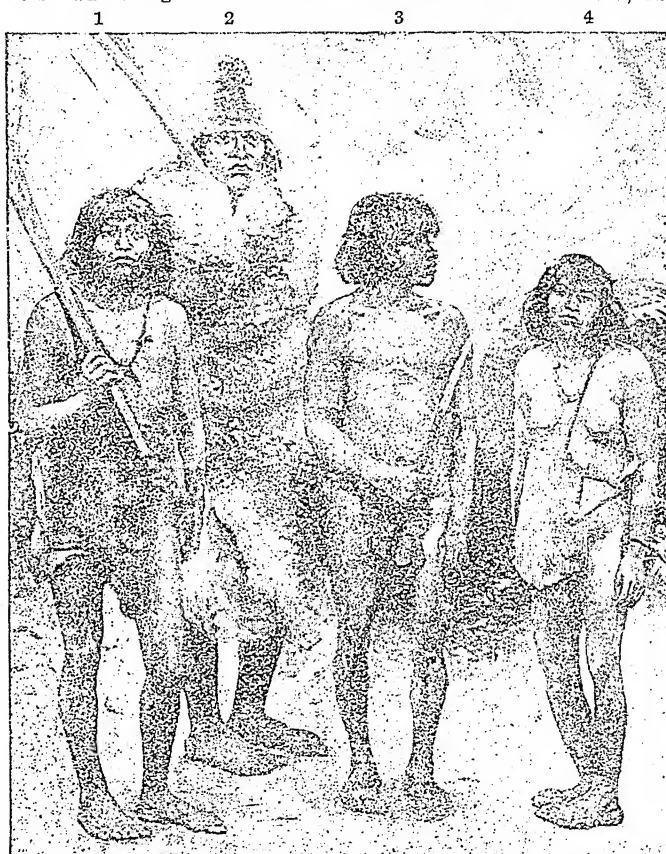
Fu-chau-fu. (1.) City in Kiang-si, China, on the E. river. Lat. 27° 55'; long. 116° 18'. (2.) City in Fu-kien. See FOCHAU.

Fu-chien. See FU-KIEN.

Fuchs, JOHANN NEPOMUK VON (1774-1856), German chemist and mineralogist, born at Mattenzell in Bavaria; in 1807 became professor of chemistry and mineralogy at Landshut, and in 1826 at Munich. Besides important researches in the subjects mentioned, Fuchs is remembered for his discovery of the process of stereochromy, for the preservation of frescoes by applying to their surfaces soluble glass. His scientific works appeared at Munich (1856).

Fuchs, LEONHARD (1501-66), German botanist, born at Memmingen, Bavaria. After becoming a convert to Protestantism, he accepted a medical professorship at Tübingen (1535). His botanical researches were summed up in his *Historia Stirpium* (1542), a description of all the plants indigenous to Germany. He also endeavoured to establish a botanical nomenclature. He achieved great success in treating victims of the 'English sweating sickness' which raged for a time

Fuchsin, or MAGENTA, is a salt, usually the chloride, of rosaniline, which is triamido-tolyl-diphenyl carbinol— $\text{HOOC}(\text{C}_6\text{H}_4\text{CH}_2\text{NH}_2)(\text{C}_6\text{H}_4\text{NH}_2)_2$. It is prepared by oxidizing a mixture of aniline and toluidine by nitrobenzene, extracting with dilute hydrochloric acid, and recrystallizing from brine. Fuchsin forms red crystals with a green lustre, that are sparingly soluble in water, but easily in alcohol. It dyes wool and silk directly, and cotton with a mordant; but



Group of Fugian Natives.

1. Alacaluf. 2. Ona. 3, 4. Yahgans.

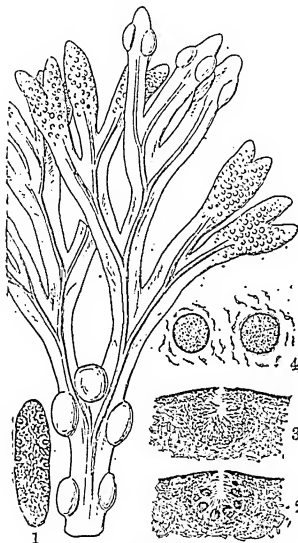
in Anspach. See Life by Hitzler prefixed to *Opera Didactica* (ed. of Fuchs's works, 1604).

Fuchsia, a plant introduced into Britain from S. America about the middle of the 18th century. The common variety, *F. coccinea*, reaches a height of five or six feet. Except near the sea and in certain warm situations, fuchsias can hardly be regarded as thoroughly hardy plants. As a pot plant the fuchsia is not difficult to propagate by cuttings taken in spring.

the colour, though brilliant, is fugitive.

Fucino, LAGO, or LAGO DI CELANO, former lake of Italy, subject to great fluctuations of volume. An attempt was made to remedy this defect by the Emperor Claudius in 44-52 A.D.; but the underground outflow tunnel (3 m. long) proved faulty, and ceased to act. The lake was finally drained in 1854-75, and is now cultivated. Its area is 40,000 ac., and it lies from 50 to 60 m. E. of Rome.

Fucus, a genus of brown seaweeds which occupy the greater part of the rocky coast of Britain between high and low water marks. All species branch dichotomously. The sexual organs are formed in globular depressions in the surface, which occur grouped together at the end of the branches. These cavities, or *conceptacula*, have each a very small opening communicating with the outside. Through these openings escape the antheridia (male) and oospheres (female). The spermatozooids are free-swimming.



Fucus.

1. Cross section of fertile frond; 2. conceptacle, female; 3. conceptacle, male; 4. zoospores and antheridia.

Fuegians, the aborigines of Tierra del Fuego, of whom there are three distinct groups—the Onas in the east, the Yahgans in the centre, and the Alacalufs in the west. The Onas appear to belong to the same stock as the Tehuelche Patagonians, whom they resemble in their tall stature, nomad life, and speech. Of the Alacalufs little is known, but that little points to their descent from the Araucanians. The true aborigines are the Yahgans, whose physical characters, especially their low stature and distinctly dolichocephalous (long) skulls, ally them to the Botocudos and other primitive long-headed races of the New World. They speak an independent stock language which has been reduced to written form, and into which parts of the Bible have been translated.

Fuego, TIERRA DEL. See TIERRA DEL FUEGO.

Fuels. The substances usually regarded as fuels have a purely organic or vegetable origin, and may be classified as follows:—

Natural Fuels: wood, peat, lignite, bituminous coal, anthracite, etc. *Prepared Fuels*, comprising (a) compressed fuels, which are composed of more or less pulverulent material, consolidated under pressure into bricks, with or without cementing material—e.g. briquettes; (b) dried fuels, or those in which the water and a certain proportion of the more volatile constituents have been expelled by slight heating—e.g. wood and peat; (c) carbonized fuels, or those obtained by heating natural fuels, such as wood or coal, to redness in a closed vessel, or under similar conditions—e.g. charcoal and coke.

Liquid and Gaseous Fuels, obtained by the distillation (partial or complete) of natural fuels, or by their incomplete combustion—e.g. petroleum, coal gas, producer gas, water gas, and oil gas. Natural oil and gas have not been discovered in any large quantities in Britain, but are abundant in the United States, Canada, Baku, Sumatra, Borneo, etc.

The value of a fuel depends upon the amount of carbon and hydrogen—the essential heat-producing elements—which it contains. Oxygen, nitrogen, sulphur, and phosphorus occur in the majority of fuels, but incidentally. Fuels also contain a certain proportion of inorganic material, which constitutes the ash—the amount of the latter, as compared with the combustible part of the fuel, being important. From a practical point of view, the chief value of a fuel is its capability of giving out heat during combustion. The heating power (generally known as the calorific power) of a fuel is the quantity of heat—measured in heat units—generated by the combustion of a unit weight (usually one pound). The heating power of a fuel is also expressed in evaporation units—i.e. by the number of pounds of water evaporated from and at 212° F. per pound of fuel.

Description of Fuels: Wood.—Air-dried wood contains from 20 to 25 per cent. of moisture, 40 per cent. of carbon, 4·8 per cent. of hydrogen, 32·8 per cent. of oxygen, and from 2 to 3 per cent. of ash. The calorific power of wood is low, because it contains very little available hydrogen.

Peat.—When air-dried, peat retains permanently about 20 per cent. of moisture; when kiln-dried, about 7 per cent. By more recent processes peat fuel is now produced by excavating and compressing machinery, and is

said to compare favourably with anthracite coal. The peat is scooped up by buckets on endless chains at one end of a machine, and is given out at the other as finished briquettes. The expense of first draining the bog is saved, and by avoiding the air-drying process some of the best elements formerly lost are retained in the peat. When peat (natural or compressed) burns it crumbles away into small pieces, the residue or coke having no cohesive power whatever.

Coal.—The usual classification is as follows:—(1.) Anthracites. (2.) Bituminous coals—(a) anthracitic coals; (b) coking and furnace coals; (c) gas coals; (d) non-coking, long-flame coals. (3.) Lignite or brown coals. (4.) Cannels.

Anthracites consist almost entirely of free carbon, up to 98 per cent. These coals are hard and dense, and do not soil the fingers; they have a metallic lustre and conchoidal fracture; the sp. gr. varies from 1·4 to 1·6. They are very difficult to ignite, but yield an intense local heat, and burn without flame or smoke. Anthracite represents a further stage of mineralization than ordinary coal, and in some coal fields the bituminous coals pass gradually into anthracites.

Anthracitic or slightly bituminous coals contain from 90 to 93 per cent. of carbon; they are rather lighter than anthracites, the sp. gr. varying from 1·35 to 1·44. These coals are somewhat difficult to ignite, and if dry there is not much tendency to smoke. They do not cake, and are excellent for steam-raising purposes. The South Wales steam coals belong to this class.

Coking and furnace coals contain from 85 to 91 per cent. of carbon; the sp. gr. varies from 1·2 to 1·25. They burn with a more or less luminous smoky flame; some coals have as much as 30 per cent. of volatile hydrocarbons in them. On heating, these coals soften and swell up, forming a dense coherent coke, which varies from 50 to 80 per cent. of the weight of the original coal. They are much used for household and furnace purposes, and for making coke.

Gas coals contain from 80 to 85 per cent. of carbon; the sp. gr. is about 1·3. They yield a large amount of gas, and burn with a long, luminous flame; on distillation they yield a coke which is less coherent than that formed from the coals of the last group. These coals are largely used for gas-making, and are also very suitable for use in reverberatory furnaces. Many of the Scottish splint coals belong to this class.

Non-caking, long-flame coals contain from 75 to 80 per cent. of carbon, and the sp. gr. is about 1.25; the available hydrogen being low, the calorific power is also low. They burn with a long smoky flame, and yield on distillation large quantities of tarry matter. The coke is somewhat soft. Coals of this class are hard, compact, and but little friable. The fracture is often conchoidal, and of such a nature as to have given rise to the name of splint coal. In colour they are rarely perfectly black; the powder is brown. They give a clean fire, high temperature, and are much prized for general use. These coals occur in abundance in Scotland, in Derbyshire, and in Staffordshire. Lignites contain from 60 to 75 per cent. of carbon. They are not of much value as fuel, and are of more recent geological date than the true coal; no doubt they are intermediate between peat and bituminous coal. They may vary from a black, structureless, pitch-like mass with a conchoidal frac-

ture to a brown mass showing a distinct woody structure. Lignites burn with a long, smoky flame, and do not cake. In Britain they only occur in appreciable quantity at Bovey Tracey in Devonshire.

Canal coals are so called because they burn with a flame like that of a candle. On heating, flat pieces are apt to fly off, making crackling noises, and on this account they are sometimes called parrot coals. Canal coals are different in structure from ordinary coal, being close and compact, black or dark gray in colour, do not soil the fingers, and often break with a conchoidal fracture. On distillation these coals yield a very large quantity of gas of a high illuminating power.

Bituminous coals are sometimes divided into two groups—viz. caking and non-caking. Coals may have identical compositions, but, at the same time, one sample may be caking and another non-caking. Caking coals have a large proportion of volatile matter, and the calorific power increases with the amount of fixed carbon. If the

coal cakes too much the grate may become blocked, and retard the passage of the air necessary for combustion. In some cases, however, it is desirable to get a bed of caked coal upon which to burn coal of a non-caking character.

Prepared Fuels.—Powdered coal, after being washed, to remove as much mineral matter as possible, is mixed and ground with from 8 to 10 per cent. of tar or pitch. The mixture is heated to the softening point of the pitch (over 170° F.), either by the external application of heat or by blowing in steam, and moulded into blocks under considerable pressure.

Liquid Fuels.—Petroleum and petroleum refuse, tar and tar refuse, have a much higher calorific power than coal. Crude petroleum consists of about 85 per cent. of carbon and 15 per cent. of hydrogen. For the same production of heat the volumes of coal and crude petroleum are about as 50 to 33. Liquid fuel gives special facilities for the

tion) are generally fixed to each boiler door, and the oil flows to the nozzles from an elevated tank. Heated air, supplied under pressure, meets the oil as it passes a conical oil-regulating valve, and the oil is rapidly vaporized during the passage down the central tube, which is provided with a helix to accelerate the process. A second compressed-air supply is given at the nose of the nozzle, where combustion is about to commence; while a third supply, induced by the action of the jet, comes through the hollow furnace front, and escapes through a cone-shaped opening round the burner. The supply of air can be regulated by means of hand-wheel, pinions, and racks, which are clearly shown in the figure. From results of tests with a marine boiler fitted with the above apparatus, it appears that 12.9 lbs. of water were evaporated from and at 212° F. per pound of Borneo crude oil.

With a furnace of suitable form, and provided with an ample supply of air, there should be practically perfect combustion without the production of soot. The sp. gr. of crude oil varies from .884 to .938. The lighter oils—such as refined petroleum, benzine, and gasoline—are now being very largely used for motive-power purposes. An oil or petroleum engine mixes its supply of oil with air, explodes the mixture with perfect combustion, and converts the potential energy of the oil into active mechanical work.

Gaseous Fuel.—Coal gas, water gas, etc., are also employed in gas-engines, furnaces, etc., and possess the following well-recognized advantages over solid fuel: they are easily handled, their combustion is under complete control, and they cause no smoke, dirt, or clinker. See GAS MANUFACTURE.

Producer Gas.—The principle involved in the preparation of this is that a jet of steam and air

development and maintenance of an intense, steady heat, prompt lighting and extinguishing of the fire, and great ease of regulation and perfect combustion. Crude petroleum can be obtained at a price which compares favourably with coal, and is being largely used for steam-raising purposes on locomotives and in steamships. Liquid fuel is burnt, in a boiler furnace, in the form of a

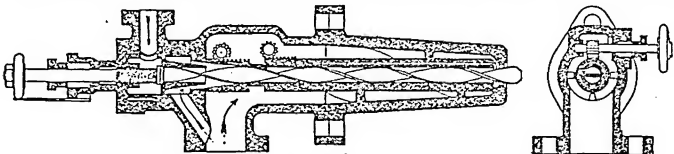


Fig. 1.—Kermod's Liquid Fuel System.

spray, the particles being sufficiently small to burn readily at the firing point of the fuel. A special burner is used, and the spraying is produced mechanically, or by means of steam or compressed air. In Kermod's liquid fuel system two spraying nozzles or burners (Fig. 1 shows one in longitudinal and transverse sec-

is passed through the generator containing anthracite coal or coke. The product from the generator passes through a series of scrubbers, and then enters the gas-holder. In the mechanical means adopted for arriving at this result there are many differences, but the apparatus generally may be divided into two classes:—

(1) pressure plant, in which the air and steam is forced into the producer by means of a blowing engine, a fan or some other form of blower, or a steam-jet; (2) suction plant, which can only use non-bituminous fuel, such as anthracite or coke. In the latter, air is sucked through the producer by the suction of the piston of the gas-engine on its outward stroke. The following are the constituents of producer gas as made by the Mond and Duff apparatus respectively:—

	Mond.	Duff.
	Per cent.	Per cent.
Hydrogen.....	24.8	23.6
Carbon monoxide.....	13.2	9.2
Carbon dioxide.....	12.9	16.0
Marsh gas.....	2.3	1.0
Nitrogen.....	46.8	50.2

The following is an analysis of gas taken from a suction-producer plant:—

	Per cent.
Carbon monoxide.....	21.8
Hydrogen.....	20.3
Oxygen.....	2

Total combustible gases.....	42.3
Carbon dioxide.....	7.8
Nitrogen.....	49.9

Total.....100.0

Oil Gas.—See GAS MANUFACTURE.

Calorific Power of Fuels.—The calorific power may be determined by calculation if the composition of the fuel is known, or by burning a weighed quantity of the fuel and absorbing the heat given off in a known weight of water. By the first method it is necessary to know the calorific power of each heat-producing element of which the fuel is composed. One pound of hydrogen, when burnt with 8 lbs. of oxygen to form 9 lbs. of water, gives off 62,032 British thermal units (B.T.U.). Also, 1 lb. of solid carbon requires 2.67 lbs. of oxygen to form 3.67 lbs. of carbon dioxide (complete combustion), and 14,500 B.T.U. are available; but if the quantity of oxygen is reduced to 1.33 lbs., forming 2.33 lbs. of carbon monoxide, the heat evolved is only 4,400 B.T.U., and the combustion is incomplete. If the temperature of the products of combustion is above 212° F., the water formed will be in the form of steam, and the true calorific power of hydrogen would then be $62,032 - (966 \times 9) = 53,338$ B.T.U. But when stating the calorific power of a substance, it is preferable not to deduct the latent heat of the water.

The effect of oxygen in a fuel on its heating value is always bad. It is generally assumed that the oxygen is already in combination with sufficient hydrogen to form water, and may therefore be left out of considera-

tion in determining the calorific power. Let C, H, and O represent the weights of carbon, hydrogen, and oxygen in 1 lb. of the fuel. Subtract $\frac{O}{8}$ from H, and the remainder is the avail-

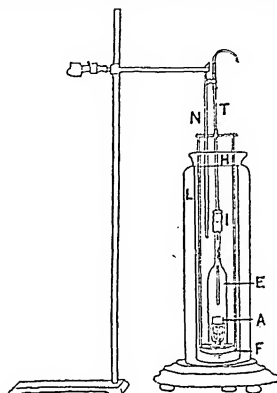


FIG. 2.—Thomson's Coal Calorimeter.

able hydrogen. From the above figures it is evident that the calorific power of hydrogen is about 4.28 times that of carbon; therefore the calorific power of 1 lb. of fuel may be expressed

hydrogen as given assumes these bodies to be in the free state, not in combination as in a fuel, and their calorific powers when in combination may be different. Again, compound bodies never give out the same amount of heat on combustion as the elements of which they are composed would do in the free state. Hence, when the calorific power of a fuel is required with a practical degree of accuracy, it is advisable to determine it experimentally by means of a calorimeter. One such is shown in Fig. 2. It is a modified Thomson's coal calorimeter. A weighed quantity (2 grams) of the coal to be tested is placed in a platinum crucible A, supported in a small metal brazier inside a glass bell E, which is secured to a base plate F by means of a brass ring and bayonet joint; there is an india-rubber washer between the bottom of the bell and the base plate, to form a water-tight joint. The bell and its connections are contained in a glass vessel H, which is supported inside a thick glass cylinder L, thus providing an air-jacket to minimize losses due to radiation. The oxygen necessary to bring about the combustion of the fuel is introduced through a tube T, which is connected to the bell by a short

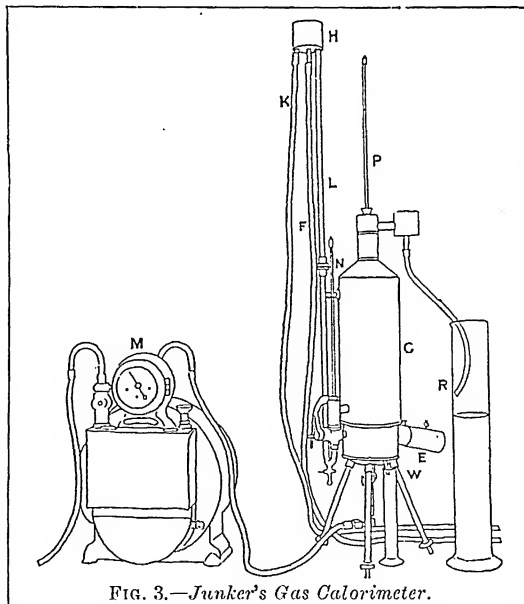


FIG. 3.—Junker's Gas Calorimeter.

thus:—Calorific power (B.T.U.) = 14,500

$$\left\{ C + 4.28 \left(H - \frac{O}{8} \right) \right\}.$$

There are possible sources of error in the above method. The calorific power of the carbon and

piece of india-rubber tube I, so that the tube T can be raised or lowered in the bell as may be required. The fuel is ignited by a short piece of fuse—cotton wick impregnated with nitrate of potassium—or by means of a

Alaric (d. 507) consolidated these enactments, with additions, into a *Breviarum*. The *Fuero Juzgo*, or *Lex Visigothorum*, was, with further additions, finally promulgated by Egica (d. 701), with the aid of the sixteenth Council of Toledo. A revised code was promulgated by Ramon Berenguer and the Council of Girona in 1068. This was again reformed and augmented by James the Conqueror (d. 1276), who promulgated an important adaptation of it for his new kingdom of Valencia (*Furs de Valencia*), in 1250; revised in 1271. In the realms of Castile the *Fuero Juzgo* was again consolidated, and ordered to be put into the vernacular by Ferdinand the Saint (d. 1252); but it remained for Alfonso the Learned (d. 1284), his son, to recast and revise it entirely, with

the inclusion of a vast mass of local and customary law, as the famous code called the *Siete Partidas*, the greatest compilation of the kind since the code of Justinian, upon which it was modelled. This superseded (1348) the *Fuero Juzgo*, and remained the basis of Spanish law until recent times.

The municipal fueros, in many cases, gave practical independence to the urban communities, with control of large territories outside their walls. The *realengo* towns, holding fueros direct from the sovereign, were represented in the king's councils, and at one time controlled the whole state. The *solariego* towns, holding fueros from tributary nobles, possessed, until the decadence of public life in Spain at the end of the 14th century, the most perfect autonomy. Many of them held what was called the *Fuero de Behetría*, which gave them the right of choosing their own overlord for life, either from a certain family (*Behetría de linage*) or freely (*Behetría de mar á mar*). Others enjoyed the *Fuero de Albedrio*, which gave them the right of self-government on very light service to the hereditary overlord. The whole of these varying charters were collected and confirmed—the *Fueros de Albedrio* by Sancho IV. (d. 1295), and the *Becerro de Behetría* by Alfonso XI. (d. 1350). The most important provincial fueros were those of the three Basque provinces (Viscaya, Guipuzcoa, and Alava), although they were less ancient than that of Leon (1020) and of some of the municipal charters—e.g. San Sebastian (1150). These three provincial fueros gave to the Basques legislative, fiscal, administrative, and military autonomy—the king of Spain being recognized only as lord of Biscay. It was the wish to preserve these privileges that gave strength to the Carlist cause, and they were finally abolished after the last defeat of Don Carlos in 1876.

Fuerteventura, or **FORTEVENTURA**, one of the Canary Is. Its capital is Betancuria, on the W. coast; but its principal harbour is Cabras, on the E. side. Area, over 650 sq. m. Pop. (1900) 11,662.

Fugger, a family of merchant princes of Augsburg, tracing their descent to a certain Ulrich, who settled in Augsburg in 1368. He and his son Johann (d. 1409) were well-to-do weavers of cotton. The wealth of the family was largely accumulated by Jakob (1468) and his sons, who mined silver in Tyrol, embarked in money-lending, and were successful in speculative trading all over Europe. One of these sons, Jakob (d. 1525), lent large sums of money to the

Emperors Maximilian and Charles V., and his nephews were created counts of the empire by Charles. The family still survives. See *Chronik der Familie Fugger vom Jahre, 1599*, edited by C. Meyer (1902); Ehrenberg's *Das Zeitalter der Fugger* (1896); Schulte's *Die Fugger in Rom* (1904); and Stanner's *Das Haus Fugger* (1900).

Fugitation, in Scots law, the sentence pronounced against a person who is charged with a crime and fails to obey the citation. The sentence puts the accused outside the law, and his goods are escheated to the crown.

Fugitive Offenders Act, 1881.

This act (44 & 45 Vict. c. 69) makes provision for the arrest and return of fugitives from justice within the British empire, and those countries to which the Foreign Jurisdiction Acts apply. Part I. of the act provides for the arrest, on an endorsed or provisional warrant, of any person found in one part of the king's dominions who is accused of having committed in some other part an offence punishable on conviction with twelve months' imprisonment with hard labour, or any convict under sentence of any British court who is at large before the expiry of his sentence. When an arrest under the act is made in Great Britain, there is a preliminary hearing at the Bow Street police court, in England, or before a police magistrate for the Dublin district, in Ireland, or before the sheriff of Edinburgh, in Scotland. Part II. deals with certain groups of British possessions to which the act is applied by Order in Council, such as Australia and New Zealand, S. Africa, and Asiatic possessions, including the E. Indies, Ceylon, and the Straits Settlements. It provides that warrants issued in one colony of a group may be backed by a magistrate in another, and the offender arrested and returned without preliminary examination. Part III. deals with offences committed on the boundary between two colonies, or on a journey from one to another, and enables the offence to be tried in either. The act may also be applied by Order in Council to places where the British crown has foreign jurisdiction, such as China, Corea, Turkey, Morocco, and Persia.

Fugitive Slave Laws, two enactments of the United States: (1) an Act of 1793, enabling the owner of a fugitive slave to seize his 'property,' and with the authority of a magistrate to remove him to his own state; (2) an Act of 1850, which added to the right of recovering a fugitive slave who had taken refuge in a 'free' state several obnoxious privileges. In the first place, every citizen was bound to render

assistance, if called on, in securing a fugitive slave; and he was guilty of a penal offence if in any way he assisted a fugitive slave to make good his escape. The Act of 1850 created so much feeling that men took pleasure in seeing it violated. It was repealed in 1864.

Fugleman, a soldier who used to be posted on a wing or flank of the regiment in advance of his comrades, to set the time for certain exercises, such as fixing bayonets.

Fugue, a musical composition of which the basis is imitation. It consists essentially in the development of a melody, from four to eight bars in length, announcing the subject (or *dux*); this is transferred to the key of the octave, the perfect fourth or the perfect fifth, above or below, and repeated with or without slight modification, to form the answer (or *comes*). Other features are the counter-subject, the *stretto* (Ital. 'narrow,' 'close'), etc.; the former an accompaniment to the subject or the answer, the latter a drawing together of the subject and answer more closely than at the beginning. Any number of parts may be used, but they should preferably be introduced early. Much freedom of treatment is allowable, together with almost unlimited intricacies in the development by means of episodes, double subjects, coda, etc.; and the composition should increase in interest as the end approaches. Fugue differs from canon by requiring different work in each part; in canon the same melody is repeated by each part beginning at a fixed interval after its precursor. Bach (J. S.) is a master fugue-writer; Handel's choruses and Mozart's symphonies afford many familiar and famous examples of the fugue. See E. Prout's *Fugue* (1891), and *Fugal Analysis* (1892).

Fuh-shan. See **FATSHAN**.

Fuji-san, **FUJI-YAMA**, **FUJI-NO-YAMA**, or, incorrectly, **FUSI-YAMA**, the highest mountain of Japan, 60 m. W. of Tokyo. Alt. 12,425 ft. A dormant volcano of singular symmetry and majesty, it is a favourite subject with Japanese artists. The most recent eruption was in December 1907.

Fu-kien, or **FO-KIEN**, maritime prov. in China, borders with Chekiang, Kiang-si, and Kwang-tung. Area, 46,320 sq. m. It has a subtropical climate. Its foreign trade depends mainly on the tea exported from Foochau and Amoy. The tea plant is largely grown on the mountain sides, but there has been a very large falling off in the trade. The province is remarkable for its beauty, the mountains which line the rivers being exquisitely clad

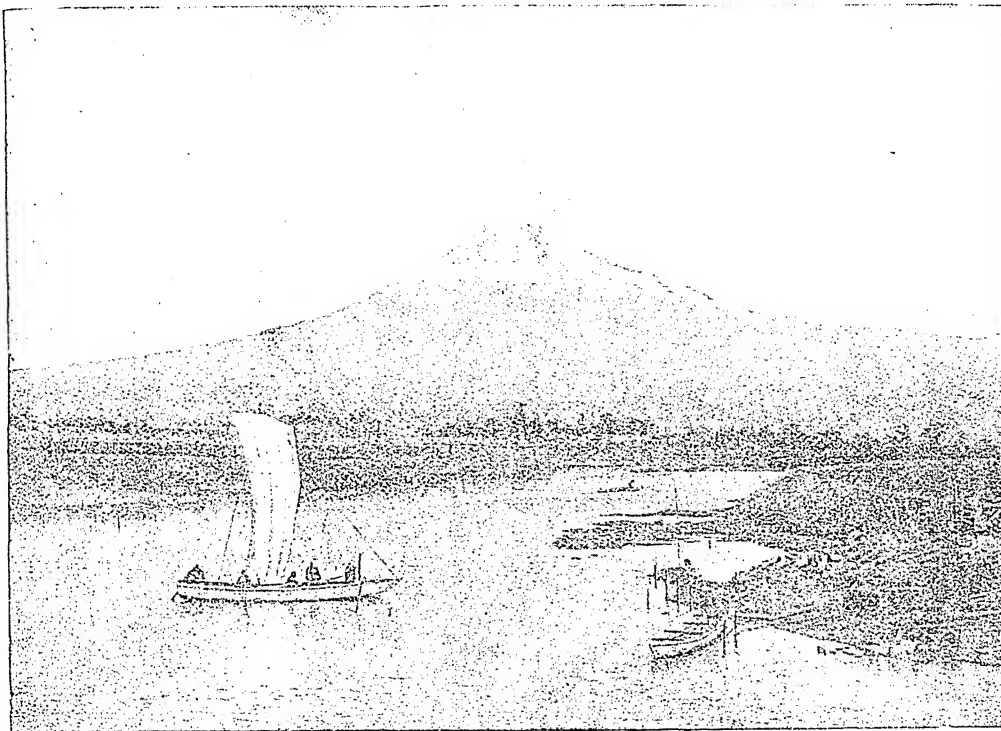
with shrubs and timber. The people on the coast are active traders and fishermen, and were formerly pirates and wreckers. Chief town, Fochau. Fukien is celebrated for its fruits (e.g. lichees, oranges, langans), and produces a considerable quantity of ginger, turmeric, etc. Besides the rice which is grown in irrigable country, sugar is also cultivated. The chief food of the labouring class, especially in the mountains, is the sweet potato. The multiplicity of dialects, and the peculiar customs of the people, separate it in many ways from the rest of China. Pop. (1901) about 23,500,000.

Fukuyama (formerly Matsumai), seapt. at S. end of Yezo, Japan, 61 m. by rail S.W. of Hakodate. Pop. 15,000.

Fulahs (otherwise FELLATA, FELLANI, FULBE, and Fr. *Peulhs*), the ruling native race in Nigeria and French Sudan, and founders of the sultanates of Sokoto and Gando. They are taller, fairer, and much less negroid than the surrounding Haussas. According to Barth, the existing Fulahs are a blend partly of Arab and Berber, and partly of Berber and negro. At an early period they migrated westward to Senegal, whence they afterwards (c. 1700) extended their influence east-

in Germany. Attached to the abbey was a theological school, famous for centuries. The abbey was converted into a bishopric in 1752. Linen, cotton cloth, salt-petre, etc., are manufactured. From 1734 to 1804 Fulda was the seat of a university. Pop. (1900) 16,900.

Fulda, LUDWIG (1862), German playwright, born at Frankfort-on-Main. Since 1888 he has lived in Berlin, except for the years 1894 to 1896, which he spent at Munich. His dramatic career began with a tragedy, *Christian Günther* (1882); and another, *Herostrat*, was published in 1898. He has written a number of clever



Fuji-yama, from Numagawa, Tokaido.

Fukui, tn., Japan, prov. Echizen, near the N.W. coast of Honshiu, 86 m. N.E. of Kyoto, is noted for its paper and tinned crabs. At the renascence Fukui became an important educational and ecclesiastical centre. Pop. (1903) 50,155.

Fukuoka, tn., N.W. coast of Kiushiu, Japan, 65 m. N.E. of Nagasaki. It is chiefly famous for its silk and woven-picture fabrics. Pop. (1903) 71,047.

Fukushima, tn. in Iwashiro prov., Nippon, Japan, 168 m. by rail N. of Tokyo; is a trading centre for raw silk and silkworms' eggs. Pop. (1898) 20,624.

ward. In 1802 one of their sheiks, Othman dan Fodio, inaugurated a religious war throughout Nigeria, and eventually conquered Haussaland for Islam. The campaigns of 1897-1903, however, compelled the Fulahs to acknowledge a British suzerainty. They probably number from six to eight millions.

Fulcrum. See LEVER.

Fulda, tn., Prussia, prov. of Hesse-Nassau, on the r. bk. of the Fulda, 69 m. by rail N.E. of Frankfort-on-Main. It owes its origin to a Benedictine abbey founded in 744, and in 968 given precedence over all other abbeys

comedies—e.g. *Unter vier Augen* (1886) and *Die wilde Jagd* (1893); several dramas—as, *Das verlorene Paradies* (1892) and *Die Zwillingsschwester* (1901). For his dramatic fairy tale, *Der Talisman* (1893), he was awarded the Schiller prize, but the German emperor refused to sanction it. An English rendering of this play (*Once upon a Time*) was produced by Mr. Beerbohm Tree in 1895. Fulda has also written *Sinnegedichte* (1888) and *Gedichte* (1890), translations of Molière's *Meisterwerke* (1892), and Rostand's *Les Romanesques* (1896) and *Cyrano de Bergerac* (1898; 15th ed. 1902).

Fulgoridæ, or LANTERN FLIES, a name given to a family of Hemiptera in which never more than two ocelli are present. Many species are prettily coloured, this being especially true of the members of the genus *Flata*. The British species are, however, small and soberly clad. Examples are *Issus coleoptratus* and *Cixius nervosus*. In spite of the common name, satisfactory proof of luminosity in the family appears to be still wanting.

Fulgurites. On mountain summits, such as those of the Alps, it has occasionally been noticed that the surface of the rock shows in places a glassy film, and that fine depressions may be present, or small droplets of vitrified rock. It has reasonably been inferred that these are the effects of lightning. On sand-hills in many places, as in S. America and N. Africa, curious natural tubes have been found projecting above the surface, and these, when examined under the microscope, prove to consist of a thin film of glass enclosing sand grains. They range in size from an inch or two in diameter downwards, and descend through the sand to depths of several feet, often branching in their course. These, too, are supposed to be produced by lightning, and are known as fulgurites.

Fulham, par. and parl. bor., co. London, England, 2 m. S.E. of Hammersmith, and opposite Putney. The Manor House, or Fulham Palace, has been occupied by the bishops of London as a summer residence since the 11th century. The once famous market gardens are now largely built over. Fulham returns one member to the House of Commons. Pop. (1901) 137,289.

Fulica. See COOT.

Fuller, ANDREW (1754-1815), English Baptist theologian, was born at Wicken, Cambridgeshire. He became Baptist minister at Soham, Cambridgeshire (1775), and at Kettering (1782). Fuller did much, chiefly through his book, *The Gospel worthy of all Acceptation* (?1785), to counteract the exaggerated Calvinism which in his day prevailed among the English Baptists. On the foundation of the Baptist Missionary Society at Kettering (1792) he became its first secretary, and from that time till his death devoted himself energetically to the work of the society. He also wrote *The Calvinistic and Socinian Systems Compared* (1794), *The Gospel its own Witness* (1799), and *Discourses on the Book of Genesis* (1806). See *Memoir* by Dr. Ryland (1816). Various complete editions of his works have been issued; that published in 1845 contains a memoir by his son.

Fuller, GEORGE (1822-84), American artist, born at Deerfield, Massachusetts; began to exhibit pictures in 1856. He was an Associate (1857) of the New York National Academy and member of the Society of American Artists. Good examples of his skill are *Winifred Dysart* and *Turkey Pasture in Kentucky*. The value of his work is much controverted. See M. G. van Rensselaer's *Six Portraits* (1889).

Fuller, SARAH MARGARET (1810-50), American writer, born at Cambridgeport, Massachusetts. In early years she was a teacher, but in 1839 issued a translation of the *Conversations of Goethe with Eckermann*, and on becoming acquainted with Emerson edited the *Dial*, the organ of the New England Transcendentalists. In 1846 she published *Papers on Art and Literature*, and set out for Europe. At Rome she married the Marquis d'Ossoli (1847), an adherent of Mazzini. After the siege of Rome (1848), her husband having lost everything, she sailed (1850) for America; but the vessel was wrecked, and she was drowned. See *Autobiography*, edited by Emerson and Channing (1852); also *Lives* by Julia Ward Howe (1883) and T. W. Higginson (1884).

Fuller, THOMAS (1608-61), English divine, was born at Aldwinkle, Northamptonshire, the birthplace also of Dryden. He became in 1634 rector of Broadwindsor, Dorset. His *History of the Holy Warre* (the Crusades) appeared in 1639. In 1640 he was in London, where he won great fame as a preacher. About this time (1641) he published *The Holy State and The Profane State*. In Westminster Abbey (1643), on the anniversary of the king's inauguration, he delivered a loyal sermon which gave offence, increased by that *Of Reformation* (July 27). To the Solemn League and Covenant he refused to subscribe, and (1643) joined the king at Oxford, where he wrote *Truth Maintained*—a reply to Saltmarsh, who had attacked his views on reformation. Then he became chaplain to Sir Ralph Hopton, and was in Basing House (1644) in one of its sieges. His regiment being driven into Cornwall, Fuller went to Exeter, and became tutor and chaplain to the queen's daughter. Here (1645) he wrote *Good Thoughts in Bad Times*. Exeter surrendered in 1646, and he compounded with the Parliament. In 1647 he wrote *Good Thoughts in Worse Times*, and the same year *The Cause and Cure of a Wounded Conscience*. We find him next (still in 1647) at Chelsea, with Sir John Danvers, stepfather of George Herbert. At length the Earl of Carlisle

made him perpetual curate (1648 or 1649) of Waltham Abbey. In 1650 he produced his *Pisgah Sight of Palestine*, on the geography and history of the Holy Land. In 1655 he published his *Church History of Britain*, including that of the University of Cambridge—a work attacked by the High Church Peter Heylyn. He wrote (1660) *Mixt Contemplations in Better Times*. At the restoration he recovered his preferments, and became a royal chaplain, but (Aug. 12, 1661) was carried from the pulpit of the Savoy to die (Aug. 16), leaving *The Worthies of England* to be completed by his son. He was in religious controversy the counterpart of Falkland in war and politics, and, like him, ingeminated 'Peace.' There was something of the statesman in his views. His wit is never forced; writers exaggerate his 'quaintness,' and forget that it is seldom ungraceful. Like Hood, he plays upon words instinctively, almost unconsciously; in both, as in Shakespeare, a pun is sometimes linked with pathos. His imagination gives life to the driest details. See *Lives* by Russell (1844), Bailey (1874), Morris Fuller (1884); criticisms by Coleridge, Southey, Lamb (the last with specimens); selections by Rogers, Jessop; a complete bibliography in Bailey's edition of the *Collected Sermons* (1874).

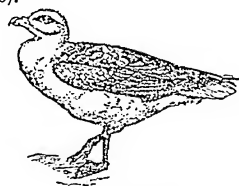
Fuller-Maitland, JOHN ALEXANDER (1856), now musical critic of the *Times*. He has written a *Life of Schumann* (1884), *Masters of German Music* (1894), *Age of Bach and Handel* (Oxford History of Music, 1902), edited appendix to *Grove's Dictionary*, etc. *English Music in the 19th Century* (1902) includes a temperate discussion of 'foreign dominations,' and shows how England has lately regained 'a position she has not held for more than two centuries.' *English Carols* (15th century) and the *Catalogue to the Fitzwilliam Virginal Book* treat subjects of national interest; *The Musician's Pilgrimage* (1899) ably depicts the prodigy, prig, virtuoso, and artist.

Fuller's Earth, a series of impure argillaceous sands which occur in the Jurassic strata of the west of England. In Somersetshire the whole group is about 400 ft. in thickness, but thins away into Oxfordshire. Interbedded with the sands and clays there is a blue marly limestone—the fuller's earth rock, from 20 to 30 ft. thick. Its characteristic fossil is *Ammonites subcontractus*, and it contains many brachiopods, molluscs, cephalopods, and other fossils. At one time this formation was of considerable importance, as yielding the principal supplies

of fuller's earth for fulling wool. It is a soft, friable, granular clay with a greasy feel, and disintegrates when placed in water, forming an impalpable powder. Some varieties are blue, others yellow, and the latter were most esteemed for practical purposes. It is still worked near Bath, in Somersetshire. Similar materials have been found in the Lower Greensand near Reigate in Surrey.

Fullerton, LADY GEORGINA (1812-85), English novelist and philanthropist, born at Tixall Hall, Staffordshire, daughter of the first Earl Granville, married Alexander Fullerton (1833), and wrote *Ellen Middleton* (1844), *Grantly Manor* (1847), and *Lady Bird* (1852). After her reception into the Roman Catholic Church her writings were largely upon Catholic subjects. Her last years were spent in practices of piety. See Oliphant's *Victorian Novelists* (1899) and *Inner Life of Lady Georgiana Fullerton* (1899).

Fulleylove, JOHN (1847), English painter in oil and water colours, born at Leicester. He devoted himself to the study of landscape; and in his pictures and drawings, which are chiefly studies of architecture in relation to gardens and landscape, he combines admirable drawing with much feeling for colour and atmosphere. He has published two fine series of drawings of the colleges and churches of Oxford and Cambridge. See *Studio*, vii. (1896).



Fulmar Petrel.

Fulmar, or FULMAR PETREL (*Fulmarus glacialis*), a near ally of the giant petrel, from which it chiefly differs in the smaller size, and in having the beak shorter than the metatarsus. It reaches a length of about nineteen inches, and though very variable in colour, usually has the head, neck, and under surface white, and the back pearly gray, with darker wing quills. It is a northern bird, and breeds in thousands on the island of St. Kilda. Only a single egg is laid, and there is practically no nest. The same (or perhaps a different) species occurs in the northern parts of the Pacific and in Bering Sea.

Fulminates are extremely explosive salts derived from fulminic acid or nitro-acetonitrile,

$\text{CH}_2(\text{NO}_2)\text{CN}$. The best known is mercury fulminate, which is obtained by the action of alcohol and nitric acid on mercury nitrate. It is a gray crystalline solid that explodes very violently on friction or percussion, and is used as the explosive agent in detonators and percussion caps.

Fulnek, tn., Moravia, Austria, 16 m. s. of Troppau. Once the seat of the Moravian Brethren, it gave its name to Fulneck in Yorkshire, England, where one of their establishments was set up in the middle of the 18th century. Pop. (1900) 3,492.

Fulton, ROBERT (1765-1815), American mechanician and engineer, born in Pennsylvania of Irish parentage. He came to England to study under West, and while there took out patents for several useful inventions. In 1797 he went to Paris, where he devoted his attention to steam navigation, and constructed a small steamboat in 1803 which navigated the Seine. Three years later he returned to America, and in 1807 launched a vessel which travelled by steam from New York to Albany, 150 miles, in thirty-two hours. This was the beginning of successful steam navigation. Fulton's inventions included flax-spinning and dredging machines and a submarine boat. He was employed by the American government in making canals. His *Life* was written by C. D. Colden (1817). See *Fulton and Steam Navigation*, by T. W. Knox (1886).

Fulvia, a Roman lady of the 1st century B.C., of dissolute character. She was married first to P. Clodius, then to Q. Scribonius Curio, and lastly, in 44 B.C., to Mark Antony. In 40 B.C., during his absence in the East, she raised a revolt in Italy against Augustus, and was besieged in Perusia. On its fall she escaped, and joined Antony at Athens, but was coldly received by him, and in the same year she died at Sicyon. Cicero attacks her character in his second philippic. See **ANTONIUS, MARCUS**.

Fumariaceæ is an order of herbaceous plants allied to the Papaveraceæ, under which order it is now often included. Its flowers have two deciduous sepals, four petals in two unlike pairs, six stamens, and a one-celled ovary. Among the genera are *Corydalis*, *Dicentra*, *Adlumia*, and *Fumaria*. The climbing *corydalis* and the ramping fumitory are typical English species.

Fumaric Acid ($\text{COOH}\cdot\text{CH}\cdot\text{CH}\cdot\text{COOH}$) is an unsaturated dibasic acid that occurs in fumitory and other plants, and is prepared by heating its stereoisomer maleic acid. It forms very sour crystals that are almost insoluble in water, and sublimes at 200° C.

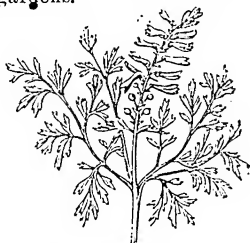
Fumay, tn., dep. Ardennes, France, 17 m. N. of Mézières, on river Meuse; has slate quarries, breweries, and engineering works. Pop. (1901) 5,668.

Fumigation. (1.) In medicine, purification by the burning or heating to the point of volatilization of drugs, such as sulphur, which when burned are antiseptic. Mercury also is used, volatilized together with hot steam, not for the purpose of disinfecting a room or clothes, as sulphur may be, but for its action upon the skin. Many antiseptics are used in the form of vapour, either for general disinfection of rooms, or for local application to the mouth, throat, or lungs. (See **DISINFECTANTS** and **ANTISEPTICS**.) (2.) A process employed by gardeners for destroying certain insects which threaten the plants of conservatory, open garden, or greenhouses. Tobacco is the substance usually employed, and one of the most effective appliances is a wire basket, one foot square and six inches deep, with a strong wire from each corner by which to suspend it. Into the bottom of this throw a handful of hot cinders, and over that another handful or two of hot charcoal. Then swing the basket about for a few minutes, and you have a good red fire. The best tobacco for fumigating is common shag. In using this tobacco, procure a handful or two of wet litter from the stable, and chopping it into pieces about an inch long, mix it with the tobacco as intimately as possible. Then place it on the fire, give the basket a swing or two in the air, and its smoke will fill the house in a few seconds. Suspend the basket in the house, and damp the tobacco should it burst into flame. The fumigation should be repeated about two days afterwards. The evening is the best time for fumigating, and still weather should be taken advantage of. Remove all plants in bloom, as the flowers soon fall after exposure to the smoke. The foliage must be perfectly dry at the time, but a thorough syringing is desirable on the morning following.

Fuming is the name given to the property that some gases and vapours possess of forming a white cloud in air. It is usually due to the formation of solid or liquid particles by union of the vapour with the moisture ordinarily present in the air.

Fumitory, or FUMARIA, is a genus of herbaceous plants belonging to the order **Fumariaceæ**. Among the native species are the common fumitory of waste ground (*F. officinalis*), whose smoke was once thought useful for expelling evil spirits, and

F. capreolata, the pink-flowered fumitory of cornfields. This latter is well worth cultivating in gardens.



Common Fumitory.

Funabashi, large tn., Nippon, Japan, on N.W. of Tokyo Bay, 11 m. E. of Tokyo. Pop. 19,200.

Funaria, a widely-distributed genus of mosses, common on old walls, ditches, and dry barren places, especially where a wood fire has been burnt. *Funaria hygrometrica* twists the stalk in proportion to the degree of moisture in the atmosphere.

Funchal, seapt. tn., episc. see, and health resort, cap. of the Madeira Is.; stands on the S. coast of the largest island (Madeira). Although it has only an open roadstead, it exports wine (£135,000 to £185,000), embroidery, and fruits, and imports coal, cereals, and textiles to the aggregate annual value of £600,000 to £700,000. It is largely visited in winter by convalescents (mostly British) from pulmonary and other diseases. Pop. (1900) 20,843.

Function, in mathematics. The notion of a function may be best illustrated by the statement of two simple cases. If we consider a series of triangles, all of the same altitude, the area of any one of the triangles will be known or determined whenever its base is known: to one value of the base there corresponds one value of the area; the area is therefore said to be a function of the base. Again, it is known that, for a given mass of gas, the pressure varies directly as the absolute temperature, and inversely as the volume: to each value of the volume and of the temperature there corresponds but one value of the pressure; the pressure is therefore said to be a function of the volume and of the absolute temperature.

In general, one quantity is said to be a function of one or more other quantities, when to each value of the latter there corresponds a definite value of the former. The latter quantities are called the arguments of the function; frequently the phrase 'independent variable' is used instead of 'argument,' and the function is then called the dependent variable. Magnitudes,

geometrical or physical, usually enter into calculations through their measures, and the word 'quantity' used above may apply either to the magnitude or to its measure; the measures will then be the variables.

A function is often denoted by a single letter, as y ; frequently it is represented by enclosing the argument or arguments within a bracket and prefixing a letter, called the functional letter or symbol, as $f(x)$, $f(x, y)$, $F(x, y, z)$. To express the kind of function considered, an equation between the function and its arguments is usually required; or, in mathematical language, it is said that the function is defined by an equation. For example, the equation $y = ax^2 + bx + c$ defines y as a function of x ; the quantities a, b, c are not supposed to change as x (and therefore y) changes, and are therefore called the constants of the function. When the equation is solved for y in terms of x , it is said to define y explicitly, or as an explicit function of x ; when the equation is not solved, it is said to define y implicitly, or as an implicit function of x . Thus, $y^2 - 2xy - x^2 - 1 = 0$ defines y implicitly; explicitly we get by solving the equation $y = x \pm \sqrt{(2x^2 + 1)}$. Here y is called a two-valued function of x ; it is made up of two functions, $x + \sqrt{(2x^2 + 1)}$ and $x - \sqrt{(2x^2 + 1)}$. In the graphical representation these represent two parts of one curve.

Functions are divided into two main classes—(1) algebraic functions; (2) transcendental functions. The simplest example of class (1) is the power, with a constant coefficient, as ax^n , $ax^m y^n$, $ax^m y^n z^p$, . . . , where m, n, p are positive integers. The sum of any number of such terms is called an integral rational function; the quotient of two such functions is called a fractional rational function; the most general algebraic function (u say) of the arguments x, y, z . . . is defined by the equation

$$Au^n + Bu^{n-1} + \dots + Ku + L = 0,$$

where A, B, \dots, K, L are integral rational functions of x, y, z Of class (2), which includes all functions other than algebraic, the simplest are: (a) the trigonometric functions $\sin x$, $\cos x$, $\tan x$. . . , and their inverses $\sin^{-1}x$, $\cos^{-1}x$, $\tan^{-1}x$. . . ; (b) the exponential function e^x and its inverse, the logarithmic function, \log^x .

In the calculus variables are supposed to be in general continuous. To see the meaning of this term, consider a point P moving along a straight line from one position A to another B , and let the distances of A, B , and P

from a fixed point O on the line be a, b, x respectively. Then as P moves from A to B , it will coincide once with every point on the line between A and B ; x therefore will take once every value lying between a and b . A variable number x which changes in this way from a to b is said to vary continuously, or to be a continuous variable. The functions considered in mathematics are usually such that when their arguments vary continuously, the functions themselves vary continuously. It is a corollary from this statement that, when each argument makes only a small change, the function itself will only make a small change; and this statement holds true of all ordinary functions, except for special values of the argument or arguments. In the graphical representation (see GRAPHIC STATICS) of a function of one variable, the graphic point, whose ordinate represents the value of the function when the abscissa represents that of the argument, traces out a continuous curve, as the abscissa of the point traces out a continuous segment of the axis of abscissae.

In recent times the study of functions defined in a purely arithmetical manner has given rise to a special branch of mathematics called the *theory of functions*. The whole theory is built up from the notion of the integral number, and is severely logical in its development, discarding altogether geometrical intuition in its demonstrations. For an excellent introduction, the reader may be referred to Harkness and Morley's *Introduction to the Theory of Analytic Functions* (1898), and *Treatise on the Theory of Functions* (1893); Forsyth's *Theory of Functions* (2nd ed. 1900); and Whittaker's *Modern Analysis* (1902).

Functions, ELLIPTIC. A rational function of x and y , where y is the square root of a quadratic function of x , requires for its integration only the elementary functions (see FUNCTION); but when y is the square root of a cubic or of a quartic function of x , it is no longer possible, in general, to effect the integration by means of the elementary functions. In this case an integral of a rational function of x and y can be made to depend on three fundamental types called elliptic integrals of the first, second, and third kind, the name elliptic being given because the integral of the second kind expresses the length of an arc of an ellipse. When y is the square root of a polynomial in x of a higher degree than the fourth, the integration requires hyper-elliptic integrals.

The elliptic integral, u , of the first kind is defined by the equation

$$u = \int_0^x \frac{dx}{\sqrt{(1-x^2)(1-k^2x^2)}} \text{ or } u = \int_0^\phi \frac{d\phi}{\sqrt{(1-k^2\sin^2\phi)}}, \text{ where } x = \sin \phi.$$

When ϕ is considered as a function of u , the three functions $\sin \phi$, $\cos \phi$, $\sqrt{(1-k^2\sin^2\phi)}$ are called the modulus; k is called the modulus; ϕ is called the amplitude of u , written $\text{am } u$; and the three functions $\sin \text{am } u$, $\cos \text{am } u$, $\sqrt{(1-k^2\sin^2 \text{am } u)}$ are usually contracted into $\sin u$, $\cos u$, $\sqrt{1-k^2\sin^2 u}$. The passage from the elliptic integral to the elliptic function led to very extensive developments of the theory.

One of the most important properties of the elliptic functions is their double periodicity (see FUNCTIONS, PERIODIC): thus, $\sin u$ has the real period $4K$ and the imaginary period $2K\sqrt{-1}$, where K is the value of u when $\phi = \pi/2$, and K' the value of u when $\phi = \pi/2$, and k is replaced by the complementary modulus $k' = \sqrt{1-k^2}$. The elliptic functions possess an algebraic addition theorem—i.e. a theorem analogous to that which expresses $\sin(A+B)$ in terms of sines and cosines of A and B .

The elliptic functions are functions not only of u , but of the modulus k ; the investigation of properties dependent on the modulus, and the expression of the functions in infinite series and in infinite products, have given rise to numerous important special theorems, and generally have led to some of the most characteristic features of modern mathematics. In recent years it has become customary to define elliptic functions without reference to elliptic integrals, and in the hands especially of Weierstrass the subject has thus acquired greater consistency, and its formulae greater flexibility, though the earlier methods of Jacobi are still of more than historical interest.

The literature of elliptic functions is enormous. For an introduction the following may be recommended:—Greenhill's *Elliptic Functions* (1892), combining the Jacobian and Weierstrassian treatment; Dixon's *Elliptic Functions* (1894); Durège's *Elliptische Functionen* (1887); Appell and Lacour's *Fonctions Elliptiques* (1897). Of the larger works the standard book is Halphen's *Fonctions Elliptiques* (3 vols. 1886); and for the historical de-

velopment, Enneper's *Elliptische Functionen* (2nd ed. 1890). The works on function theory by Harkness and Morley, by Forsyth, and by Whittaker contain much that bears on elliptic functions.

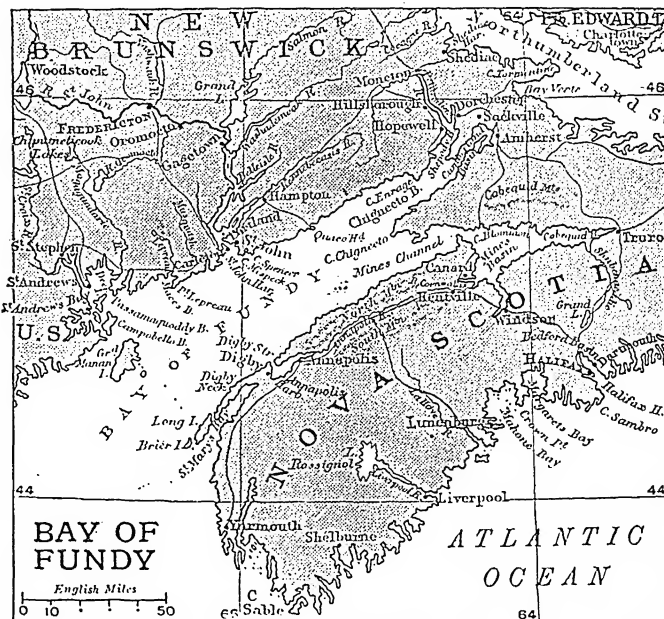
FUNCTIONS, PERIODIC. Of the elementary mathematical functions (see FUNCTION), those called the trigonometric functions possess the remarkable property that when the angle is increased or diminished by 360° , or by any integral multiple of 360° , the value of each function is not altered. These functions are therefore called periodic, and the angle 360° , or its equivalent 2π radians, is called the period; the tangent and the cotangent have

The coefficients are definite integrals—

$$A_n = \frac{2}{a} \int_0^a f(u) \cos \frac{2n\pi u}{a} du; \\ B_n = \frac{2}{a} \int_0^a f(u) \sin \frac{2n\pi u}{a} du.$$

(See FOURIER SERIES.) Fourier's theorem has a wider range than the above enunciation indicates: $f(x)$, for example, may have a finite number of discontinuities, but the form given to it above sufficiently indicates its nature.

A function $f(x, y)$ of two variables is called periodic, its periods being a, b , if $f(x \pm ma, y \pm nb)$ is equal to $f(x, y)$ for every integral value of m and of n . A similar



the shorter period, 180° , or π radians. In general, a function $f(x)$ of a single variable x is called periodic, its period being a , if $f(x \pm na)$ is equal to $f(x)$ for every integral value of n .

The most important theorem regarding periodic functions of a single variable is the following (Fourier's theorem):—Every continuous single-valued periodic function $f(x)$, of period a , can be expressed as a convergent series of the form—

$$\frac{1}{2} A_0 + \sum A_n \cos \frac{2n\pi x}{a} \\ + \sum B_n \sin \frac{2n\pi x}{a},$$

where n has all values from 1 to ∞ .

theorem to that just given for a function of a single variable holds for a function of two variables; the definitions and expansions can be easily extended to functions of more than two variables, but these are of less importance.

Though not periodic functions of two variables in the sense just defined, we may rank with periodic functions those called spherical surface harmonic functions. These are functions of the angular (polar) co-ordinates θ, ϕ of a point on a sphere, and are solutions of a certain differential equation (Laplace's equation). The harmonics of the one variable θ are called zonal surface harmonics. There is a theorem corresponding to Fourier's theorem for the ex-

pansion of any continuous function of θ , ϕ in terms of surface harmonics.

A doubly-periodic function $f(x)$ of a single variable x is one such that $f(x \pm ma \pm nb)$ is equal to $f(x)$ for every value of m and of n ; a , b are called the periods of the function. It is impossible, however, for a function to be doubly periodic if both periods are real; further, a single-valued analytic function cannot have more than two distinct periods. None of the elementary functions are doubly periodic; the simplest doubly-periodic function is an elliptic function.

For the treatment of Fourier's theorem and allied theorems, the reader may consult Byerly's *Fourier Series and Spherical Harmonics* (1895); Todhunter's *Functions of Laplace* (1875); Ferrers's *Spherical Harmonics* (1877); Heine's *Kugelfunctionen* (1878). Two papers by Gibson in the *Proceedings of the Edinburgh Mathematical Society*, vols. xi., xii., may also be referred to.

Funds. See NATIONAL DEBT.

Fundy, BAY OF, an arm of the N. Atlantic Ocean, 145 m. in length and 35 m. in average breadth, between New Brunswick and Nova Scotia, Canada. Its branch, the Passamaquoddy Bay, receives the St. Croix R. The St. John R. flows into the main bay. At its head the bay divides into two branches—Chignecto Bay in the N.E. and Minas Channel in the E. The rapid rise and fall of tides is noteworthy, the difference between high and low water at Chignecto being over 50 ft.

Fünen (Dan. *Fyn*), the second largest Danish island, lying between the Kattegat and the Baltic, and separated from Zealand by the Great Belt, and from Jutland by the Little Belt. Area, about 1,100 sq. m. It is a very fruitful island, and well wooded. Pop. (1901) 279,785.

Funeral Rites. See BURIAL.

Funeral Societies. See FRIENDLY SOCIETIES.

Fünfhaus, suburb of Vienna.

Fünfkirchen, or PÉCS, tn., Hungary, cap. of prov. Baranya, 110 m. s.w. of Budapest. The name is derived from five Turkish mosques, three of which are now in ruins and two in use as churches. There is a fine 12th-century cathedral. Manufactures leather, cloth, and pottery. Pop. (1900) 43,980.

Fung-hwang, the Chinese phoenix, regarded as a harbinger of prosperity; also as an emblem of good luck, usually embroidered on the robes of an empress.

Fungi, a class of Thallophytes, in some classifications including the Schizomycetes (fission fungi, or bacteria) and the Myxomycetes (slime fungi). The name is now

generally confined to the Hyphomycetes, which may be defined as saprophytic or parasitic forms of green algae, distinguished by their lack of chlorophyll, whence follows their inability to assimilate inorganic substances. In the lower forms the threadlike vegetative thallus

single-celled mycelium, with sexual as well as asexual reproduction. Here belong the species which infest fish and insects, and cause the potato disease and the 'false mildew' of the vine, together with the moulds which grow on bread, cooked meat, and other provisions. In the higher



Common Fungi of the Mushroom Type.

1. *Agaricus ceruginosus*. 2. *Lactarius turpis*. 3. *Cortinarius dilaphus*. 4. *C. violaceus*. 5. *Paxillus atromentosus*. 6. *Russula azurea*. 7. *Agaricus velutinus*. 8. *A. tessellatus*. 9. *A. longicaudatus*. 10. *A. sinuatus*. 11. *A. Schistus*. 12. *A. Bloxani*. 13. *A. truncatus*. 14. *Coprinus aratus*. 15. *Lactarius flexuosus*. 16. *Hydrophorus confusus*. 17. *Coprinus domesticus*. 18. *C. micaceus*. (All $\frac{1}{2}$ nature.)

may consist of a single cell, simple or branched (as in the Moulds). This filamentous cell is a hypha, and the whole hyphal mass forms the mycelium, or vegetative body, the upper part of which, in the higher groups, may constitute a stemlike stroma or thallus, as in the mushrooms. The lowest series, the algal fungi, have a

series the hyphae constituting the mycelium consist of many cells, and reproduction is entirely by spores. There are four main groups:—(1.) Hemiasci, in which the spore-cases bear some resemblance to those of the next group, but contain an indefinite number of spores; some of the species live in the tissues of host

plants, and the yeast fungi also belong here. (2.) Ascomycetes, a large group, chiefly parasitic, with the spores developed in asci, or long tubular cases, each usually with eight spores. Of this group there are three divisions: (a) Perisporiaceae, with enclosed fructification, which is ruptured to free the spores, represented by the mildew fungi and the truffles; (b) Pyrenomyces, discharging the spores from a flask-like receptacle (to which belong *Claviceps purpurea*, the fungus of ergot, parasitic on rye; *Cordyceps*, parasitic on the larvae of insects; and *Botrytes bassiana*, which causes the 'musccardine' disease of silkworms); and (c) Discomycetes, with the fructification more or less basin-shaped and exposed, as in the cup fungi (*Peziza*) and the morels. (3.) Hemibasidii, the brand fungi, causing smut in cereal plants; the mycelium is converted into spores. (4.) Basidiomycetes, bearing the spores on club-shaped cells. The chief subdivisions are the Hymenomyces, in which the hymenium or spore-bearing surface is exposed and spread over the laminae or gills, as in the mushrooms and toadstools; and the Gasteromyces, in which the hymenium is internal, as in the puff balls and earth-stars.

Fungibles, a term applied in civil law to such things as can be replaced by equal quantities and qualities—e.g. a bushel of wheat.

Funiculus, a name given to the stalk by which the ovule or seed is often connected with the ovary wall or partition of flowers.

Funkia, a genus of liliaceous plants commonly known as plantain-lilies. They are handsome plants with bold foliage, often quaintly marked, and with racemes of beautiful flowers. They are all hardy, and easily grown in ordinary garden soil, preferring that which is rich and deep.

Funny Bone, the popular name for that point on the elbow, a little to the inner side of it, and at the back, where the large ulnar nerve lies close to the surface in a groove at the back of the lower extremity of the humerus, or bone of the upper arm. When the point of the elbow is struck or rubbed forcibly, the ulnar nerve is irritated, with the result that part of the arm and some of the fingers are numbed.

Fur. When the constituent elements of the hairy coat of a mammal are densely set, and soft and fine in texture, the name of fur may be appropriately applied to the coat. The use of the fur to the animal is usually to give warmth, and we thus frequently find that the winter coat constitutes a much more valuable product than the summer one.

A notable example is the stoat, whose winter coat, under the name of ermine, is one of the most costly of furs. For the same reason, as a general rule, the furs which are most prized are those which are obtained from mammals—e.g., the bear and the Arctic fox—inhabiting high latitudes, for it is in these that the coat is densest. But the dense, close fur of the mole is related less to the necessity for warmth than to the protection of the skin from the irritating effects of particles of soil during burrowing. The somewhat similar fur of the beaver has partly, no doubt, a similar function; but more important is its power of throwing off water so as to prevent the chilling of the surface of the skin. The same type of fur, with the same double function, occurs in the Australian ornithorhynchus.

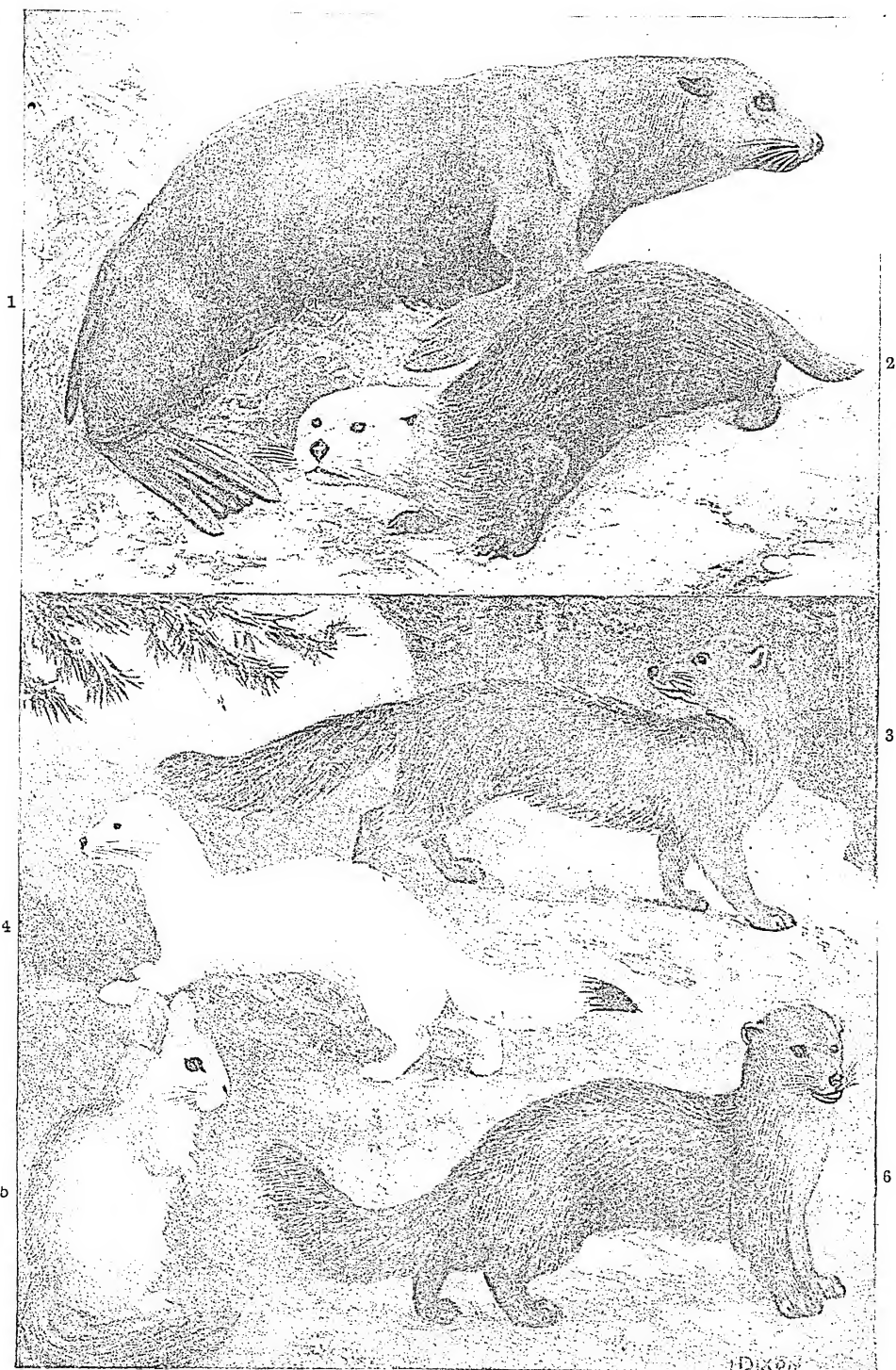
Fur is used both for purposes of dress and, separated from the skin, for felting in the manufacture of hats. For this purpose the fur of the beaver was formerly largely used, but genuine 'beavers' have been superseded by the silk hat, and by cheaper furs in the manufacture of the ordinary felt. Rabbit fur is principally employed, but 'nutria,' from a small South American animal, the coypu, is also used in felting. Many of the furs, used both for felting and for clothing, are really the fine woolly undergrowth of the skin, and are, in the unprepared skin, mixed with or even covered by a growth of coarser hair. When the hair is to be used for felting, these coarser fibres must first be removed. Ingenious cutting machines are now employed for removing the skin, and for sorting the fur according to its fineness. Its felting power is often increased by treatment with a nitric acid solution of mercury. See HATS.

The dressing of fur skins is a trade the details of which are preserved in secrecy. By one method the skins are first treated in a bath of bran, alum, salt, and water, to cleanse and preserve the pelt; then washed with soap to remove dirt and oiliness from the fur, and softened by mechanical stretching. (See LEATHER.) Some furs are dressed by drumming with butter and sawdust, and in other cases the two processes are to some extent combined. In the fur seal, the undergrowth of soft fur is covered with one of coarse hair, which is more deeply rooted, and which is loosened by shaving the inner side of the skin till its roots are cut away. Many furs are dyed; that of the seal is originally a mousy brown. Most seals are dyed by one firm in London, and the secret of the rich brown required is most jeal-

ously kept, but it is said to be produced by repeated treatment with some mixture containing pyrogalllic acid. Aniline dyes are also produced specially for fur-dyeing. Many of the most important furs are derived from small animals of the weasel tribe, such as ermine, minx, sable, and marten. The more expensive furs are, of course, imitated in cheaper skins; and many furs (e.g. nutria) are known, when finished, by fancy names which have no relation to the animal from which they are obtained.

The fur trade is of prehistoric antiquity in Asia, but first appeared in Europe about the 6th century, when sable skins were brought to Rome. Italian traders introduced Asiatic furs into England; but it was not until the establishment of the Hudson's Bay Company in 1670 that the British trade rose into importance. A large business was before then carried on by the French colonists and *voyageurs* of Canada.

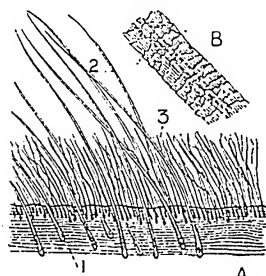
Among the less valuable fur-bearing animals are the hare, rabbit, and opossum, worth from 6d. to 2s. each; badger, the best coming from Germany, 2s. to 6s.; musk rat and skunk, from North America; squirrel, the best from Northern Europe and Asia, of fluctuating value; and cat, especially the wild cat, the best coming from Holland, fine black specimens being worth from 4s. to 8s.; nutria, a skin used chiefly for the manufacture of felt, is sold at from 1s. to 2s. per pound. Of larger animals, besides lions and tigers may be mentioned the bears, black, brown, grizzly, and white. The black bear skin, from America, is worth from £1 to £4; the brown, found in the Hudson's Bay Territory, is much more valuable and rare; the white, found in Arctic regions, is sold for from £10 to £20; the grizzly variety is worth less, and is found in the west of the United States only. The otter, of a brownish-black colour, from Labrador and Canada, is worth from a few shillings to £3. The sea otter, from the North Pacific coasts, is of considerable value, the best skins fetching from £20 to £100. Beavers' skins from Labrador are sold by the pound. Lambs' skins come from Persia; the finest are worth from 12s. to £1, the Astrakhan variety costing much less. The lynx, of silver-blue colour, comes from Sweden and Labrador; value 8s. to £1. The wolf is worth from a few shillings to £2. The inferior specimens come from the prairies of America, the best from Labrador. Most important of all is the seal, found in the Pacific and South Atlantic, the greatest number coming from Alaska. The value of the salted



Fur-bearing Animals.

1. Fur seal. 2. Sea otter. 3. American marten. 4. Ermine. 5. Chinchilla. 6. Sable.

skins varies between £2 and £10, those from Alaska being less valuable. Among the more costly furs are chinchilla, of which there are two kinds, the real and the bastard. This small South American rodent, of pearly gray colour, is from 8 to 10 in. long. The best are from Peru, and are worth from 4s. to 12s.; the bastard, from Chile, cost but a few pence. (Chinchilla means the Chilean skin.) The American mink, an animal of semi-aquatic habits, once called the lesser otter, dark chestnut-brown in colour; value of the best from 12s. to £2. The Russian variety is smaller and less valuable. The American marten is of great value; it is rich brown in colour, the tips of the tails being used as artists' brushes. The finest come from Labrador, and are worth up to £5. The stone marten, found in Europe, of dull gray colour, is worth about half a guinea. The Russian sable marten yields one of the most precious furs, a fine specimen of



A, Section of skin of fur seal: 1, skin; 2, coarser hairs; 3, fine fur. B, Fur highly magnified.

dark blue colour fetching as much as £30. There are various kinds of foxes, the most valuable being the silver variety, perhaps the most beautiful of all furs, of pale silver or blue-black colour, from Labrador and Moose Fort, worth from £10 to £40. The blue, from Greenland and Archangel, has a value of £2 to £4. Other kinds are the white, red, and gray. The ermine is a stoat; the best specimens, from Siberia, are of varying value; the colour is pure white, except the tip of the tail, which is black. The raccoon has fur like the beaver, and comes from the United States. In colour it is silver blue or shaded brown, worth from a few shillings to several pounds. Prices are, however, constantly fluctuating, and the values here given are but approximate.

Furcræa, a genus of tropical American succulent plants belonging to the order Amaryllidaceæ. They sometimes live for a long number of years before flowering, and after fruiting die.

Furfurane, C_4H_4O , is an oily liquid of pleasant smell, occurring in wood tar. It has a 'ring' constitution, and may be looked on as the parent substance of many derivatives. If the oxygen atom is replaced by sulphur, thiophene (a compound occurring in benzene, and closely resembling it) is obtained; while pyrrol (a constituent of bone oil, and connected with the alkaloids) is formed if an NH group is substituted instead. Furfurol, C_4H_3OCHO , is the aldehyde of furfurane, obtained by the action of dehydrating agents on carbohydrates, such as bran, grain, etc. It is an oil of a pleasant odour, is apt to turn brown, and is suspected to be partly the cause of the poisonous effects of crude spirits, in which it is present. When acted on by ammonia, it yields a crystalline mass of furfuralide.

Furiæ. See EUMENIDES.

Furka Pass. Traversed by a carriage road, this pass (7,992 ft.) leads from Goeschenen (at the N. mouth of the St. Gothard tunnel), in the Swiss canton of Uri, up the Reuss valley, past Andermatt, to the extreme head of the Rhone valley, close to the source of that river in the great Rhone Glacier.

Furley, SIR JOHN (1836), born at Ashford, Kent. One of the founders of the St. John Ambulance Association in 1877, he became chief commissioner of the Central British Red Cross Committee in the S. African war (1900-2). In connection with ambulance work he attended the Franco-German war (1870-1), the Carlist war (1874), and the Russo-Turkish war (1877).

Furlong. This measure of length, now representing one-eighth of a mile, was originally the length of the ancient acre, which had a definite form, being 40 rods in length by 4 rods in breadth. On the old English open or common field system, each furrow ploughed equalled in length the acre, and the distance was called *furlong* ('furrow-long').

Furlo Pass, tunnel through the Apennines in Italy, on the ancient Via Flaminia from Rome to Fano, on the Adriatic, 20 m. from the latter. It was constructed by the Emperor Vespasian in 76 A.D.

Furlough, the absence, with leave, of non-commissioned officers and men, and, in the Indian army, of an officer. Furlough is granted at the discretion of the commanding officer. From October 1 to February 1 nearly twenty-five per cent. of each regiment is on furlough on full pay, each man usually for a month at a time, but longer if his home is

at a great distance. A soldier on furlough may not leave the United Kingdom.

Furnaces are devices for the useful application of heat, produced, as a rule, by the combustion of fuel, but of late years also by the conversion of electrical energy. The ordinary combustion furnace varies considerably, according to the class of fuel (e.g. whether solid, liquid, or gaseous, or of high or low calorific power), and also according to the intensity at which the heat is required (e.g. whether it is to be employed in evaporating water or fusing a metal). In any case, the object aimed at is to bring the fuel and air together in such proportions that combustion may be as complete and regular as possible, and the heat utilized in the manner required and not wasted. In the furnaces for heating boilers the fuel is spread on a grate of fire-bars spaced a small distance apart, between which a portion of the air for combustion is drawn. As a consequence, the coal is converted into gases, either by decomposition by heat or by partial combustion; these gases burning above the fuel, and in contact with the boiler shell or tubes, partly by the air coming through the fuel, but chiefly by that admitted above it. The supply of air is more easily regulated than that of fuel, for with hand-firing the addition of the latter is intermittent, and the proportions of air to fuel are in consequence very variable. 'Mechanical stokers,' which in general consist of a hopper to contain the fuel and feed it on to a series of travelling fire-bars, by which it slowly traverses the furnace and is regularly burned, get over to a great extent the difficulty of the intermittent supply of fuel in those cases where they are applicable. The supply of air can be adjusted by dampers, etc., and needs to be carefully regulated, as excess provides an extra quantity of gases to be heated, thus conveying heat up the chimney, whilst an insufficient supply causes imperfect combustion, and unburnt fuel, chiefly in the form of carbon monoxide, passes away and is wasted, both extremes also causing smoke. Air is usually provided by the draught of a chimney, in which the hot gases, being lighter, ascend, and their place is taken by fresh air passing through the fire; but as the lofty chimney that is required to produce a sharp draught is not always convenient, as in steamships and locomotives, air is often forced through the furnace by fans, or drawn through by the injector action of a jet of exhaust steam placed in the exit of the

furnace gases. In a similar way, in those furnaces where very high temperatures are required, draught is hardly sufficient, and jets of air under pressure are forced over the glowing coals by fans, bellows, or blowing engines. This is the practice in the forge, in the cupola furnace for iron-founding, and in the blast-furnace for the reduction of iron ores. For the latter purpose the furnace consists of a tower of firebrick that is cylindrical externally, but narrows towards the top and bottom internally, and which is cased in iron to strengthen and support it. The ore, fuel, and flux are fed into the top of the furnace, whilst the air-blast enters near the bottom through 'tuyères' or blowpipes that are water-jacketed to prevent fusion. The molten iron collects below the level of the tuyères, and is drawn off from time to time, whilst the gases produced in the operation are led away at the top of the furnace, and, being combustible, are utilized for heating purposes. (For diagram, see IRON.) The cupola furnace is of the same general arrangement, but of much smaller size, and is without provision for the collection of waste gases.

In many cases it is desirable to keep the substance that is being heated from contact with the solid fuel or its ashes. This is carried out either by means of a reverberatory furnace, or by the use of gaseous fuel. In the reverberatory furnace (Fig. 1) the grate, *g*, for the fuel, and hearth, *h*, for the substance to be heated, are placed side by side, but separated by a low division, under a brick arch; the chimney, *c*, being at the opposite end of the furnace to the fire, so that the flames are drawn over and beaten down on the hearth by the action of the draught, aided by the arch. Reverberatory furnaces differ

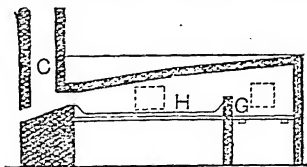


FIG. 1.—Reverberatory Furnace.

according to the use to which they are to be put. Thus, a puddling furnace for purifying pig iron has a comparatively large grate; a roasting furnace for calcining ores, where the temperature need not be so high, has, on the other hand, a far larger hearth; whilst in a furnace for smelting lead the hearth much in the proportions of hearth to grate, shape of hearth, etc.,

is deep, so that the molten metal can be collected and tapped off; and in a glass-furnace the fire is central, and the flames are drawn outwards over the glass-pots. It is sometimes necessary to avoid even the access of the furnace gases to the objects to be heated—a result that is attained by placing the object to be heated in an arched, thin-walled fireclay chamber, or muffle, that is heated externally.

Gas Furnaces.—Besides those

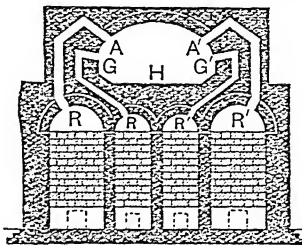


FIG. 2.—Gas Furnace.

furnaces heated by illuminating gas, either on the bunsen burner or blowpipe principle, which are in universal use for laboratory and small-scale operations, gas firing with a cheap gas has also a very extended application on the large scale. Its great advantages are its cleanliness, and the freedom from risk of contaminating the material to be heated with undesirable impurities; the ease with which it is regulated, and its flame made of an oxidizing or reducing character; and, lastly, the possibility of using the waste heat of the furnace on the Siemens regenerative principle to heat up the gas and air to be burnt, thus reaching a higher temperature and economizing fuel. The gas employed is usually a form of 'producer gas,' consisting mainly of carbon monoxide mixed with about 65 per cent. nitrogen, obtained by drawing air through red-hot coal; whilst the furnace (Fig. 2) is of the reverberatory shape, gas and air being passed in at different inlets, *A*, *A'* and *G*, *G'*, and burning over the hearth, *H*. The waste gases from the furnace are led through one of two pairs of chambers, *RR* and *RR'*, loosely packed with firebricks, which thereby become very hot. As soon as one pair of chambers is sufficiently heated, the waste gases are sent through the second pair to heat them, whilst the gas and air about to be burned are led through the first pair on their way to the furnace, and are thus heated by the hot bricks. When this process has cooled the brickwork sufficiently, a change is made to the other pair

of chambers that have been heating up, and so on. In the newest types of this kind of furnace the regenerators are placed at the side, and not under the hearth.

For the production of the highest temperatures, furnaces in which coal gas or hydrogen is burnt with pure oxygen were formerly employed, but have been largely superseded by electrically-heated furnaces. Electric energy as compared with the energy of combustion is very expensive, but possesses the marked advantage that far higher temperatures can be attained, whilst the expense is largely reduced by the fact that electric heating can be more closely applied to the substance to be heated, and that there are not necessarily any waste gases to convey heat away; so the proportion of energy actually utilized is greater than in the case of heating by combustion.

Electric furnaces are usually divided into two classes—*viz.* those in which the heating effect is produced by electric arcs, and those in which it is caused by the resistance offered to the current. There is, however, no very sharp line to be drawn between the two, either theoretically or practically, as the arc itself owes its temperature to the resistance of carbon vapour, whilst in resistance heating minor arcs often play an important part. Electric furnaces differ in construction according to whether the product is to be obtained as a gas, as in the case of phosphorus or carbon disulphide; as a liquid, like calcium carbide; or as a solid, like graphite. The separation of both a vapour and a liquid is illus-

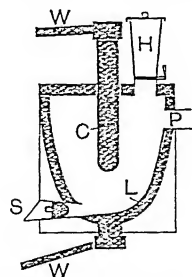


FIG. 3.—Electric Furnace.

trated in Readman's furnace for the preparation of phosphorus, as shown in Fig. 3. A mixture of calcium phosphate, coke, and sand is put in by the hopper, *H*, and the terminals of a continuous or alternating current dynamo connected by the leads, *WW*, to the carbon pole, *C*, and carbon lining, *L*, of the furnace. Arcs are thus formed between *C* and *L* and the carbon of the charge.

heating the mixture so that phosphorus is set free, and passes off in vapour with carbon monoxide through a pipe, P, near the top of the furnace, the rest of the constituents forming a liquid slag that is tapped off at S, at the foot. Carbide furnaces are also of the arc type, but owing to the high fusing point of the carbide, which renders it difficult to tap off, are not, as a rule, run continuously. Furnaces in which the product is a solid, as in the

Electric furnaces of either of these kinds must be distinguished from those in which electrolysis takes place, as in the preparation of aluminium, which are electrolytic cells rather than furnaces. Such cells may be distinguished by the fact that they only work with direct and not with alternating currents. See Snow's *Furnace Heating* (2nd ed. 1901); Graham's *Hints on the Construction and Working of Regenerating Furnaces* (1894); Mills and

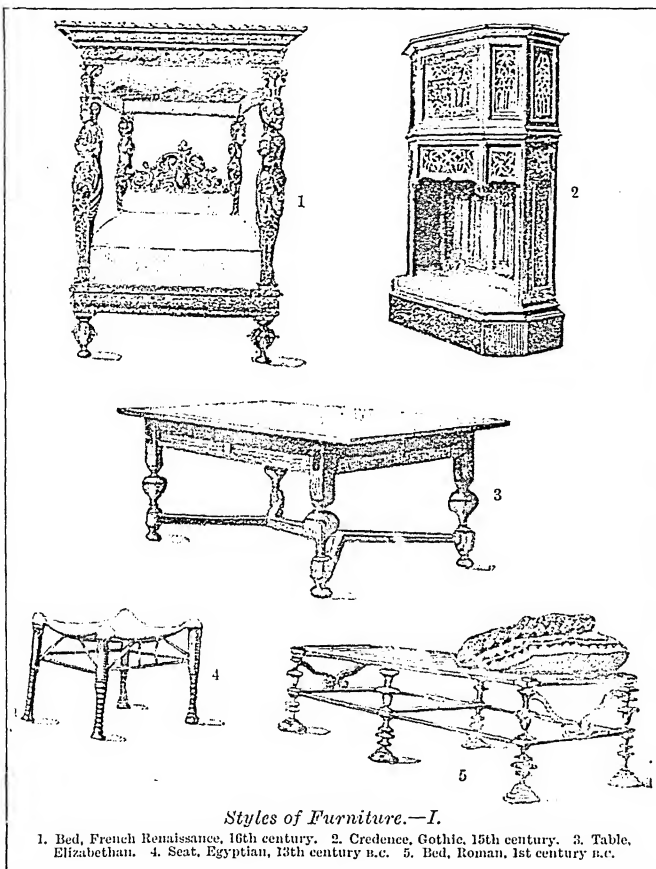
Furnes (Flemish, *Veurne*), tn., Belgium, prov. W. Flanders, 16 m. by rail N.E. of Dunkirk; has several buildings of the 15th to the 17th century, also linen mills and tanneries. It was captured by Alexander Farnese in 1583. Pop. (1900) 5,796.

Furness, peninsula of N. Lancashire, England. Rich beds of hæmatite iron ore were known and smelted at Walney in ancient times, and have led to the rise of the town and docks of Barrow. Furness Abbey (founded 1127) is near Alton.

Furness, SIR CHRISTOPHER (1852), head of the English shipping firm of Furness, Withy, and Co., born at West Hartlepool, Durham. At twenty-four he started in business for himself as a shipbroker—a venture which was speedily followed by the establishment of the 'Furness line' of steamers. In 1885 he joined Mr. Edward Withy of Hartlepool, for the purpose of building, engineering, and fitting out vessels—a step which laid the foundations of the present firm. He has represented the Hartlepool in the Liberal interest in 1891-5 and since 1900.

Furniss, HARRY (1854), caricaturist, born at Wexford; was special artist on the *Illustrated London News*, and began illustrating *Punch's* 'Essence of Parliament' (1880). His humorous illustrations of books include *Beckett's Comic Blackstone* (1887); *Burnand's Incomplete Angler* (1887), and *Happy Thoughts* (1890); *Carroll's Sylvie and Bruno* (1889); *Davidson's Fleet Street Eclogues* (1890); *Lucy's Diary of the Salisbury Parliament* (1892). He left *Punch* (1894) and started *Lika Joko*, a comic threepenny, which merged in the *New Budget*, and soon dropped. He has lectured at home and in U.S.A. on 'Arts and Artists,' 'Humours of Parliament,' 'Harry Furniss at Home,' etc. Author of *Romps* (1885-6), *Royal Academy Antics* (1890), *P. and O. Sketches* (1898), *Confessions of a Caricaturist* (2 vols. 1901), *Poverty Bay* (1905), and *How to draw in Pen and Ink* (1905).

Furniture. The word includes the movable articles—textile fabrics or cabinetmakers' work—necessary for use and comfort in a dwelling-house. The oldest existing beds and chairs are Egyptian, dating from 1500 B.C., and structurally resembling modern European examples. The Greeks used little and very simple furniture; tables were general, but chairs few, beds used only for sleep. The Romans also had few articles of furniture, but these were richly ornamented, veneered, carved, and inlaid with metal; and the couch used for reclining



Styles of Furniture.—I.

1. Bed, French Renaissance, 16th century. 2. Credence, Gothic, 15th century. 3. Table, Elizabethan. 4. Seat, Egyptian, 13th century B.C. 5. Bed, Roman, 1st century B.C.

preparation of carborundum or of graphite by the Acheson process, are of a very simple character, the materials being piled on a firebrick bed from 20 to 30 ft. long around a semi-conducting core of pieces of carbon which form the connection between the carbon poles, to which the cables conveying the current are connected. The heap is built round by loose bricks, which allow the escape of gaseous products, the heat being generated by the resistance of, and the arcs between, the pieces of carbon.

Rowan's *Fuel and its Applications* (1889); and Baldwin's *Steam Heating for Buildings* (1900).

Furnarius, the genus to which the oven-bird belongs. See OVEN-BIRD.

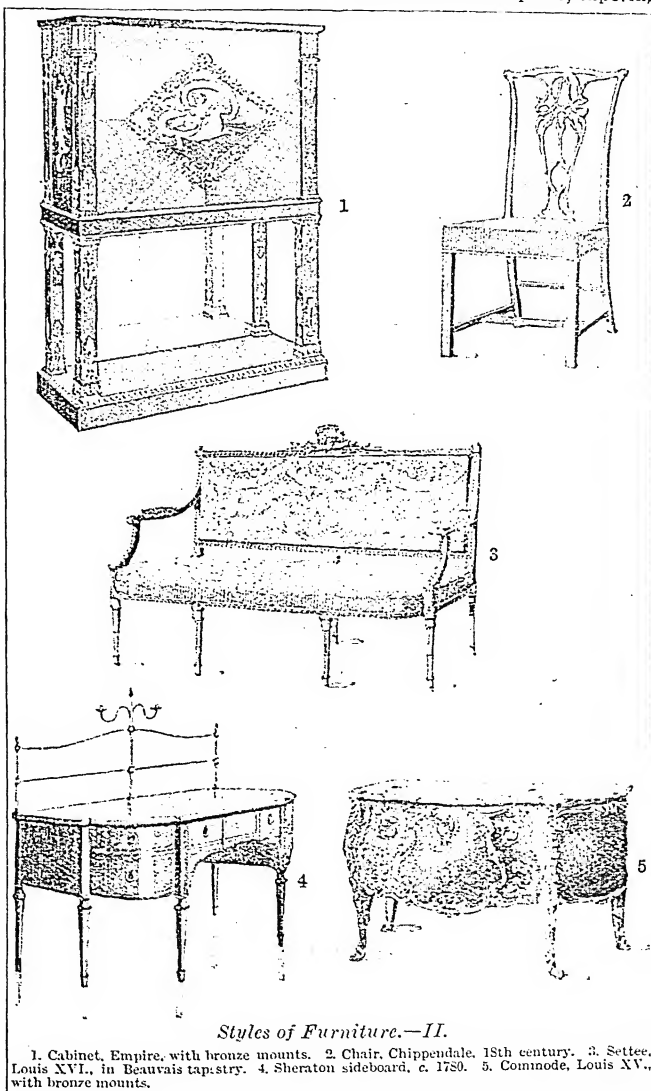
Furieux or Flinders Islands, a group in Bass Strait, between Tasmania and Victoria, Australia. The chief is Flinders, or Great Island (35 m. by 10); the others are Cape Barren, Clark, Hummock, and Babel. They are mostly barren, and were named after Cook's lieutenant, Furieux, who discovered them in 1773.

at meals was the most important object in a Roman house. In Constantinople more furniture was used, and the custom of reclining at meals ceased, benches taking the place of couches. The conquest of Constantinople scattered its productions throughout Europe. The chair of St. Peter at Rome is in characteristic Byzantine style—of gilded wood, panelled with carved ivory and gold. Italy having adopted Byzantine artistic traditions, spread their influence over Europe, and was long the headquarters of the furniture industry.

In England barbarous simplicity was characteristic of the Saxon, whose beds and chairs were merely rough boxes. Norman influence fostered luxury; and as petty warfare ceased, furniture became more elaborate: bedsteads of carved wood richly draped, coffers, chairs, and fireplaces carved in conventional patterns, were generally used. Gothic art affected the decoration, which became representations of architectural details and natural forms: the coronation chair is a typical example of furniture of the period; tables, which had earlier been boards laid on trestles, now resembled modern dining-tables, and carved dressers and coffers to hold tapestry were usual. The decline of Gothic art was later followed by the renaissance, whose influence, felt in England after 1550, produced the mixture of Gothic, Flemish, and Italian styles known as Tudor. Later this lost its distinctive delicacy and grace, and approximated more nearly to the classic style of the Italian and Flemish renaissance. The forms of carving grew heavier and the execution coarse, while chairs and tables became unwieldy. The long settle and folding table, with twelve, sixteen, or twenty legs, came into use. The commonwealth fostered puritanical simplicity of design, but under Charles II. furniture was luxurious and decorative. The immigration of French workmen in 1685 caused important modifications. Marquetry of wood, and *boule* marquetry of metal and shell, were introduced, and forms were necessarily much modified by the use of flat surfaces. Later these became *bombé* or rolled, as in *Louis XV.* furniture, which was smaller and more elaborate than in the preceding period, and decorated with inlay, lacquer, gilt mounting, and carvings, and upholstered with tapestry or brocade. *Queen Anne* furniture is ponderous in style, simple in outline and decorated after the fashion of Grinling Gibbons, with carved lifelike representations of birds, animals, and plants. In

1769 the *Brothers Adam* introduced the application of delicate composition ornaments to woodwork. Festoons and wreaths tied with ribbon are the favourite elements. *Chippendale* adopted Chinese ornament and rococo style. His furniture, carved in mahogany and decorated gen-

surfaces. *Hepplewhite* furniture resembles Chippendale, but is simpler, and is generally japanned and painted gold on a black ground with fruit and flowers. The dining-tables of this period were of the 'pillar and claw' type. *Sheraton*, in its severe lines and square, tapering



Styles of Furniture.—II.

1. Cabinet, Empire, with bronze mounts. 2. Chair, Chippendale, 18th century. 3. Settee, Louis XVI., in Beauvais tapestry. 4. Sheraton sideboard, c. 1780. 5. Commode, Louis XV., with bronze mounts.

erally with a foliated scroll, is of excellent workmanship, and entirely without fret or inlay. His chair backs are open and carved, not covered with upholstery. *Ince* and *Mayhew*, whose works resemble and are often mistaken for Chippendale's, are distinguished by their carved fretwork applied to the solid

legs, recalls Adam furniture; the decoration is almost entirely marquetry.

The French revolution caused a revival of classic or 'empire' furniture, stiff, uncomfortable, and much decorated with metal work; the restoration brought a debased rococo style known as 'baroque,' which still further

degenerated into the unlovely 'early Victorian' style. This was followed by the Gothic revival; and Japanese influence makes the furniture of to-day light and flimsy. The fashion set by the Arts and Crafts Exhibition of 1903 will probably be followed in cumbrousness and solidity.

Until recent times furniture manufacture was carried on by workmen, who took apprentices for instruction in all branches; but the more general use of machinery and the restrictions imposed by trades-unionism have created division of labour. Cabinetmakers do the finer work of turning and joining, and make all large articles except sofas and chairs; these are constructed by chairmakers and couchmakers. Cabinetmakers and chairmakers are employed in factories and workshops, or more largely still by small makers keeping six or eight workmen.

In London, Bethnal Green is the manufacturing centre, Shoreditch the chief market, while the middlemen of Curtain Road sell to Tottenham Court Road, the suburbs, and the provinces.

The woods chiefly used are walnut, Spanish and Honduras mahogany, oak, pine, deal, birch, and beech, and, less often, satinwood, rosewood, ebony, and sandalwood.

Mahogany and walnut logs three feet square, and of fine grain suitable for veneers, are often worth £1,000. They are exposed to the weather for a year or two, while oak often takes eight years to season. Cheaper woods are rarely allowed more than a few months to dry. See F. Litchfield's *Illustrated History of Furniture* (1893); J. H. Pollen's *Ancient and Modern Furniture and Woodwork* (1874), and *Furniture and Woodwork* (ed. G. P. Bevan, 1876); E. Bonaffé's *Le Meuble en France* (1887); H. Havard's *Les Arts de l'Ameublement* (1897); A. Jacquemart's *Histoire du Mobilier* (1876); Bumpus's *Furniture and Decoration in England during the 18th Century* (ed. Aldam Heaton, 1892); Maurice B. Adams's *Examples of Old English Furniture* (1888); E. Aves's *Life and Labour of the People* (ed. Booth, 1889); *Furniture Trade*, vol. i. (1889); P. Macquoid's *A History of English Furniture: the Age of Walnut* (1905); F. Roe's *Old Oak Furniture* (1905); Morse's *Furniture of the Olden Time* (1903); C. Simon's *English Furniture Designers of the 18th Century* (1904); Robinson's *English Furniture* (1906); and works by Chippendale, Sheraton, Ince and Mayhew, and Hasluck.

Furniture Cream is prepared by dissolving resin and beeswax in hot turpentine, and mixing

with a solution of potassium carbonate and powdered soap in water, when a thick cream is obtained. On applying this to furniture, the turpentine dissolves the polish on the surface, and the wax, resin, and soap quickly give a new surface.

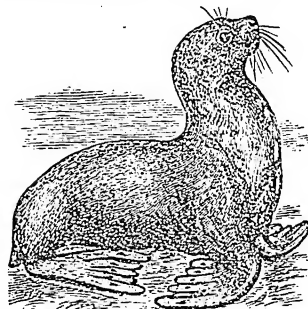
Furnivall, FREDERICK JAMES (1825), English philologist, born at Egham, Surrey. He helped to establish the London Workingmen's College. Appointed in 1854 honorary secretary of the Philological Society, he largely influenced the compilation of the *New English Dictionary*, which began to appear in 1884. In 1864 he established the Early English Text Society, in 1868 the Chaucer and Ballad Societies, in 1874 the New Shakespeare Society, in 1881 (with Miss Hickey) the Browning Society, in 1882 the Wycliffe Society, and in 1886 the Shelley Society. For these and the Roxburghe Club he edited indefatigably. Among his numerous publications these may be mentioned: *Saint Graal*, the history of the Holy Grail in English verse, by Henry Lonelich, A.D. 1440 (2 vols. 1861-3); Robert of Brunne's *Handlyng Synne* (1862); Walter Map's *Quest del Saint Graal* (1864); *Political, Religious, and Love Poems* (1866); Bishop Percy's *Folio MS. of Ballads and Romances* (2 vols. 1867-8); *Six-text Print of Chaucer's Canterbury Tales*, (1868-77); 'The Succession of Shakespeare's Works,' introduction to Gervinus's *Commentaries* (1874); minute and elaborate introduction to the *Leopold Shakespeare* (1877), reprinted with *Royal Shakespeare* (1880, and in 1891 and 1898); *Originals and Analogues of some of the Canterbury Tales*, with Messrs. Brock and Clouston (1888); *Caxton's Eneydos*, with Mr. W. T. Culley (1890); *Hoccleve's Works* (pt. i. 1892; pt. iii. 1897); *The English Conquest of Ireland, A.D. 1165-85*, from Giraldus Cambrensis (1896); *Lydgate's Pilgrimage of the Life of Man*, pt. i. (1899).

Furruckabad. See FARRUKHABAD.

Furse, CHARLES WELLINGTON (1868-1904), English painter. He studied under Legros at the Slade School, afterwards working in Paris. His talent is many-sided. His portrait of Mr. Justice Collins, exhibited in 1893 by the New English Art Club, of which he is a member, witnesses to his sound technical qualities and observation of character; while the painting of the horse and hounds in *The Master of the Hounds*, exhibited in the same year, showed fine draughtsmanship, strong handling, and individuality of treatment. He takes rank among those painters of the impression-

ist school who seek fresh modes of expression without departing from the fundamental principles of the British school.

Fur Seal, or SEA-BEAR, a name given to those members of the family Otariidae, or eared seals, in which a woolly under fur is present; this under fur constitutes the sealskin of commerce. The other members of the family Otariidae have only the long-haired outer coat without any under fur, and are often called hair seals. About five species of fur seal exist, the best known being *Otaria ursina*, which is the only one found in the northern hemisphere. The chief haunt of this form is the Pribylov Islands, where the seals are now strictly protected. Like other members of the Otariidae, the seals 'haul up' at the breeding season, the young being born on land, in what are known as 'rookeries' or breeding-places. Certain localities are also known as 'hauling-grounds,' being inhabited by young males or



Fur Seal.

bachelors. It is these bachelors which alone are killed. In addition to this, a large amount of pelagic sealing is carried on in the Bering Sea by vessels from British Columbia. There appears to be little doubt that the fur seals are decreasing in number, but it is uncertain whether this is due to the destruction of breeding females by the pelagic sealers, or to the land-sealing. An interesting account of the northern fur seal and of fur-sealing will be found in *The Royal Natural History*, vol. ii. (1894). The other fur seals are southern forms, one of the commonest being *O. pusilla*, the Cape fur seal, whose fur is, however, not of great value. For the northern forms, see J. A. Allan's *History of the North American Pinnipeds* (1880). See also SEAL.

Fürst, JULIUS (1805-73), German Orientalist, born at Zerokowo, of Jewish descent. He settled at Leipzig in 1833, became *lector publicus* in 1857, and professor of Aramaic and Tal-

mudic literature in 1864. He published numerous works on Oriental languages and literature; among them, *Concordantia Veteris Testamenti Hebraica et Chaldaica* (1837-40; Eng. trans. 1871); *Die Sprüche der Väter* (1839); *Kultur- und Literaturgeschichte der Juden in Asien*, vol. 1. (1849); *Bibliotheca Judaica* (1849-63); and *Geschichte der Biblischen Literatur und des Jüdisch-Hellenistischen Schriftthums* (1867-70).

Fürst, WALTHER, Swiss hero, who represented the canton of Uri in the compact made at the Rütli by the Lake of Lucerne in 1307, when Werner Stauffacher represented Schwyz, and Arnold Melchthal Unterwalden. This union was made for the liberation of the cantons from the Austrian yoke. See Schiller's play of *Wilhelm Tell*.

Fürstenbund, THE, or LEAGUE OF PRINCES, was formed by Frederick the Great on July 23, 1785. Its object was to check the attempt of the Emperor Joseph II. to secure Bavaria. It embraced Prussia, Saxony, Hanover, and numerous smaller German states.

Fürstenwalde, tn. Prussia, prov. Brandenburg, 21 m. by rail w. of Frankfurt-on-the-Oder; has breweries, malt-kilns, glass and other factories. Pop. (1900) 16,765.

Fürth, tn. Bavaria, prov. Middle Franconia; lies immediately N.W. of Nuremberg, and, like it, manufactures mirrors, gold leaf, bronzes, toys, pencils, fancy ornaments, picture-books and chromo-lithographs, gold and silver wares, chicory, machinery, beer, etc. Pop. (1900) 54,144.

Further India. See INDO-CHINA.

Fur Tribe. See DARFUR.

Furze, certain species of shrubs belonging to the genus *Ulex*, a subdivision of the Lotus group of the order Leguminosae. The common furze, whin, or gorse (*Ulex europaeus*) is an almost leafless shrub, thickly armed with green spikes, and during a great part of the year showy with light-yellow flowers. There is a double variety sometimes grown in gardens. There also occurs wild on hill-sides and commons in Britain a more dwarfish species, *U. nanus*, which flowers in the autumn. In certain districts furze is still of great value as fuel.

Fusan (Korean, *Pusan*), treaty port on Korea Bay, at S.E. tip of Korea, opened to foreign trade in 1876. It is the terminus of the Seoul-Fusan railway (250 m.), and consists of the old Korean city and the new Japanese town. Rice, beans, ginseng, and hides are exported. A considerable fishing industry exists. Pop. (1903) 50,000, of whom 14,000 were Japanese.

Fusaro, LAGO, also called the ACHERUSIAN LAKE, a small lake of Italy, 6 m. W. of Naples, famous for its oysters.

Fuscaldo, tn., Italy, prov. Cosenza, on the W. coast of Calabria, 15 m. N.W. of Cosenza. Pop. (1901) 9,544.

Fuse. Explosives are usually fired by detonators containing mercuric fulminate. These are ignited by fuses, of which there are three classes—(1) slow-burning, safety, or time fuses; (2) quick-burning and detonating fuses; and (3) electrical fuses. (1.) The first-named, used in mining, are generally composed of a core of compressed gunpowder surrounded by waterproof yarn, and burn at the rate of a foot in thirty seconds. Another sort of time-fuse, attached to projectiles, contains a composition with a known rate of combustion. (2.) For service use, it is often necessary to have fuses burning almost instantaneously (e.g. 500 ft. per second), and consisting of wicks coated with uncompressed gunpowder; or even the more rapid detonating fuses, made of fulminated cotton (velocity of combustion, 5,000 ft. a second), of nitro-cellulose enclosed in leaden pipes, etc. (3.) Still better for war purposes are electrical fuses, in which the passage of a spark or the incandescence of a wire ignites a sensitive 'priming mixture'; this inflames the detonator. See Guttman's *Manufacture of Explosives*, ii. (1895); W. Walke's *Lectures on Explosives* (2nd ed. 1897).

Fuseli, HENRY, or JOHANN HEINRICH FUESSL (1741-1825), Anglo-Swiss painter and author, born at Zürich. He was elected A.R.A. in 1788, R.A. in 1790, professor of painting in 1799, and keeper in 1804. His artistic expression did not equal his powerful imagination. His best efforts are *The Nightmare*, *Titanic and Bottom* (National Gallery), and *Oedipus and his Daughters* (Walker Art Gallery, Liverpool). His *Lectures on Painting* have had a widespread influence on art. See collected edition of literary works, edited by Knowles, with memoir (1831).

Fusel Oil is mainly a mixture of propyl, butyl, and amyl alcohols that is formed along with the ethyl alcohol obtained by spirituous fermentation, and hence, though largely separated by distillation, is a constituent of most alcoholic liquors. Fusel oil is of disagreeable smell and taste, and is chiefly utilized for the preparation of amyl acetate for solvent and flavouring purposes. The common belief that fusel oil is the chief cause of the poisonous effects of inferior spirits has been disproved.

Fushiki, or FUSHIGI, seapt. on Toyama Bay, W. coast of Nippon, Japan. It has been one of the 'special open ports' since 1889. Pop. 20,000.

Fushimi, tn., Japan, 6 m. by rail from Kioto; was the scene, in January 1868, of a severe struggle between the followers of Shogun and the imperialists. Pop. (1898) 21,515.

Fusible Metal. The melting-point of an alloy is generally less than the mean of the temperatures of fusion of the components—a feature which is very marked with certain alloys of bismuth, which melt below the boiling-point of water. Examples are: (a) bismuth 2, lead 1, tin 1 (ordinary fusible metal)—melting-point, 93.7° C.; (b) bismuth 8, lead 5, zinc 3 (Newton's)—fusing-point, 94.5° C.; (c) bismuth 5, lead 3, tin 2 (Rose's)—fusing-point, 91.6° C.; and (d) bismuth 15, lead 8, tin 4, cadmium 3 (Wood's)—melting-point, 68° C. Such alloys expand on cooling, and thus take fine impressions of moulds; they are therefore used in electrotyping and the like.

Fusilier, originally a foot soldier armed with a lighter musket than ordinary. Afterwards fusilier regiments were deemed *corps d'élite*, as the 5th, 7th, 20th, 21st, 23rd, 27th, 87th, 101st, and 102nd regiments of foot.

Fusi-yama. See FUJI-SAN.

Fust, JOHANN (d. 1466), partner of Gutenberg, was a native of Mainz. After supplying Gutenberg with funds to carry on his printing enterprise at Mainz, and sharing the profits from 1448-53 (during which period the Mazarine Bible was produced), Fust suddenly claimed the restoration of the funds supplied, and established a separate printing-house with Peter Schöffer, publishing in 1457 a folio edition of the Psalter. Fust has been wrongly identified with the Faust of German legend.

Fustel de Coulanges, NUMA DENIS (1830-89), French historian, born in Paris, was appointed professor of history at Strassburg in 1860. His first historical work, *La Cité Antique* (1864; Eng. trans. 1874) made its author famous, and ultimately caused his appointment to a specially-created chair at the Sorbonne. He was also instructor to the Empress Eugénie. After the war of 1870 he turned to French history. His principal production, *Histoire des Institutions Politiques de l'Ancienne France*, was completed and published by C. Jullian in 6 vols. (1892). His essays appeared as *Recherches sur quelques Problèmes d'Histoire* (1885), as *Nouvelles Recherches* (1891) and as *Questions Historiques* (1893). See P. Guiraud's *Fustel de Coulanges* (1896).

Fustic is the name given to two distinct dye materials. (1.) The wood of the smoke plant, *Rhus cotinus*, is the yellow fustic, or young fustic. The colour obtained from this is somewhat evanescent. (2.) The wood of *Macbrura tinctoria* is the old fustic of commerce, and is used to dye woollens various shades of yellow, the colours being much more permanent than those produced by young fustic.

Fusulina, a spindle-shaped, calcareous shell, sometimes half an inch in diameter, belonging to a genus of the group Foraminifera. In shape it somewhat resembles a grain of wheat, and when broken open it is seen to consist of many small chambers, which in the living condition are filled with protoplasm. It is one of the most complex and highly-organized animals of its group, and bears a considerable resemblance to the better-known nummulites. These shells are especially abundant in the Carboniferous period. *Fusulina* limestones are largely developed in Japan, China, Russia, Sumatra, and N. America.

Fusus, a genus of gasteropods to which belong some common British whelks, and which includes in *F. colosseus* perhaps the largest living gasteropod. The shell is fusiform, with a many-whorled spire and a long,

straight canal. One of the British species, *F. antiquus*, is dredged for the market.



Fusus.

Futa-Jallon, a region (area, about 42,500 sq. m.) in the interior of French Guinea. It is an elevated country (alt. about 4,000 ft.) with a fairly favourable climate, and is rich in cattle, and yields gold and other W. African products. The rivers Senegal and Gambia rise in it, and the head-waters of the Niger are on its escarpment. The capital is Timbo, but the largest town is Tuba.

Futa-Toro, a fertile territory in the northern part of French Senegal, W. Africa. Has tamarind forests, and exports pig-iron. Pop. (estimated) 120,000.

Futehgunge. See FATEHGANJ.

Futhorc. See RUNES.

Fuze. See FUSE.

Fuzuli. See TURKEY—Literature.

Fyffe, CHARLES ALAN (1845-92), English historian, born at

Blackheath, London; was the author of *History of Modern Europe* (3 vols. 1880-90), which was widely read. During the Franco-German war he acted as correspondent to the *Daily News*, and was in Paris during the commune.

Fylfot, a pre-Christian form of cross, found on very ancient remains in Southern Europe. It has an immense range in both hemispheres, and is the *swastika* of the Buddhists. See Wilson's *Swastika* (1896).



Fylfot.

Fyne, sea loch, an arm of the Firth of Clyde, Scotland; runs in a N. and N.E. direction from Bute Sound for 40½ m. through Argyllshire. Its breadth varies from 1 to 5 m. On its w. side are E. Tarbert Loch, with the fishing town of Tarbert; Loch Gilp, with Lochgilphead, and Ardrishaig at the S.E. end of the Crinan Canal. Inveraray lies on the w. shore, near the head of the loch. Loch Fyne herrings are famous for their size and flavour.

Fyzabad. See FAIZABAD.

F.Z.S., Fellow of the Zoological Society.

G

G. The original sound of this letter is retained in such words as 'beg.' This is its value in scientific notation; it is a voiced k, or voiced back stop (see K). The sound in the modern English name, generally used before e, i, and y, is a compound = d + zh; it appears from the 14th century under old French influence. The simple sound zh occurs in some words (e.g. 'rouge') under modern French influence. G has also acquired these same values in Arabic.

Gh usually represented spirant k, when that was an English sound. It has now become silent, as in 'plough,' or changed into f, as in 'laugh.'

Since the invention of printing, y, and occasionally z, have been substituted for G, because of their resemblance to one of its written forms. From an early date this form resembles z: a variety of it is that still used in the modern Irish alphabet; g and g are modifications of it. In the 13th and 14th centuries, in English, this form stood for spirant g, also written gh.

In form G is a modification of C (see ALPHABET), and that a rounding of Γ, and that a turning of the early Semitic form to the right.

G in music is the fifth note of the natural diatonic scale of C. See SCALE.

Gá is the Old English form of the High German *gau*, which corresponds with a division of the country.

Gabacho, the Catalan designation of the natives of certain parts of the eastern Pyrenees; used also as a term of contempt for a Frenchman.

Gabbro, a massive, dark-colored, crystalline rock, similar in structure and texture to granite, but corresponding in composition to the basalts. It is the plutonic representative of the basic igneous rocks, and has formed by slow cooling at great depths. The minerals of gabbro are basic plagioclase feldspar, augite (diallage), and often olivine. All gabbros contain also iron oxides and apatite, and some, in addition to these, quartz, orthoclase, garnet, hornblende or biotite. When diallage is replaced by hypersthene, the rock is known as norite, or olivine norite, according as it does or does not contain olivine. Anorthosite is a gabbro in which the plagioclase feldspar greatly preponderates over the other minerals. Gabbros are common in Britain, especially in the Inner Hebrides. They cover enormous areas in Canada, and are found

in some of the eastern states of America. In Sweden, Finland, and Norway many large outcrops of gabbro are known. They tend, as a rule, to be accompanied by serpentine.

Gabelentz, HANS CONON VON DER (1807-74), German philologist, born at Altenburg; filled various posts under the governments of Saxe-Weimar and Saxe-Altenburg. He is said to have learned eighty languages, in thirty of which he could converse with ease. He made a special study of the Finno-Tartaric languages, and in 1833 published *Eléments de la Grammaire Mandchoue*, which was followed in 1841 by *Grundzüge der Syriänischen Grammatik* and *Die Melanesischen Sprachen* (1860-73). He contributed copiously to the *Zeitschrift für die Kunde des Morgenlandes*, of which he was joint-editor.—His son, HANS GEORG CONON VON DER GABELENZ (1840-93), born at Poschwitz, near Altenburg, was professor of Eastern Asiatic languages at Leipzig (1878) and Berlin (1889), and wrote *Chinesische Grammatik* (1881), *Beiträge zur Kenntnis der Melanesischen, Mikronesischen und Papuanischen Sprachen* (1882), *Confucius und seine Lehre* (1888), and other books.

Gabelle, an oppressive tax on salt in pre-revolutionary France. Every individual over the age of seven years, not being a member of the privileged classes, was forced to buy a certain quantity of salt at the price fixed by the government. See E. P. Beau-lieu's *Les Gabelles sous Louis XIV.* (1903).

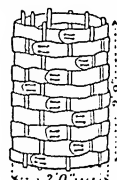
Gabelsberger, FRANZ XAVER (1789-1849), inventor of the chief German system of shorthand, born at Munich; he became a member of the Bavarian civil service, chiefly in the ministry of the interior. His system is generally adopted in German-speaking countries, and is described in his *Anleitung zur Deutschen Redenzeichenkunst oder Stenographie* (2nd ed. 1850; reprinted 1900). He also published *Neue Vervollkommnungen in der Deutschen Redenzeichenkunst* (2nd ed. 1849). See *Gabelsberger's Leben und Streben* (2nd ed. 1886), by Gerber.

Gaberlunzie, or GABERLUNZIE-MAN, an old Scotch name for a strolling beggar or mendicant; also a king's bedesman, who was a licensed beggar. The class is well represented in Edie Ochiltree of Scott's *Antiquary*.

Gaberones, ry. stn. (alt. 3,328 ft.), British Bechuanaland, between Mafeking and Palapye.

Gabes. See CABES.

Gabinus, AULUS, tribune of the commons at ancient Rome in 67 B.C., when he carried a law conferring extraordinary power on Pompey for waging war against the pirates. He was consul in 58, and from 57 to 54 governor of Syria. On his return to Rome in 54 he was tried for extortion and condemned; he went into exile, but on the outbreak of the civil war in 49 he was recalled by Caesar, whose side he took. He died in 48 B.C.



Gabion.

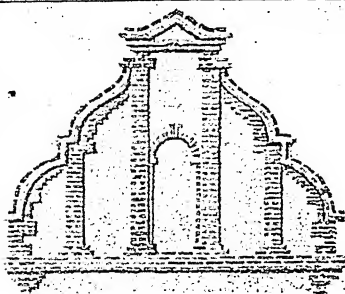
Gabion, an open cylinder made of brushwood, canvas, wire-netting, or iron bands, for use in fortification. Filled with loose earth, gabions are placed on end, in tiers, to form a wall, behind which earth can be piled at a steeper slope than it would naturally assume; and the whole becomes a rampart impervious to shell-fire. Iron-band gabions are liable to splinter under fire, and are now replaced by gabions of Willesden paper.

Gable, that portion of the wall of a building which fills the triangular space formed by the junction of the roof-slopes. In early examples gables were merely finished with a plain coping. Later they were ornamented with crockets or battlements, or broken into steps called 'corbie steps,' and terminated in a cross or some other ornament. It was characteristic of mediæval domestic architecture that the houses generally turned their gable ends to the street.

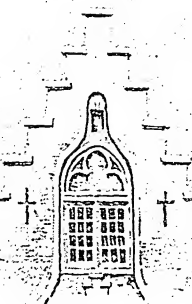
Gablonz, tn. Bohemia, Austria, on the Neisse, 8 m. by rail S.E. of Reichenberg; produces glass buttons, pearls, and ornaments, also cottons, woollens, and cardboard. Pop. (1900) 21,086.

Gaboon. See GABUN.

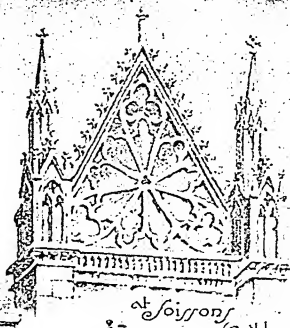
Gaboriau, EMILE (1835-73), French author of detective stories, born at Saujon; became famous through his novel *L'Affaire Lerouge*, which appeared in *Le Pays* in 1866, and was followed by *Le Dossier 113* (1867), *Le Crime d'Orléans* (1868), *Monsieur Lecoq* (1869), *Les Esclaves de Paris* (1869), *La Vie Infernale* (1870), *L'Argent des Autres* (1874), and *La Dégringolade* (1876).



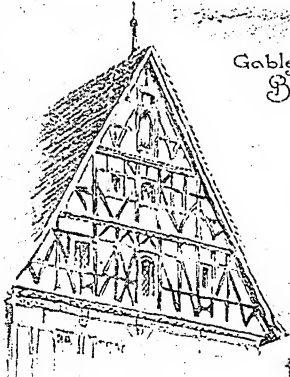
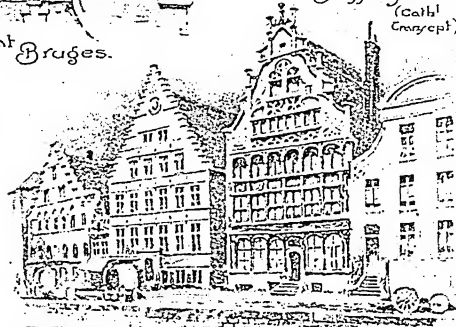
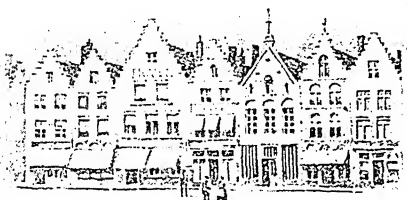
A brick and flint Gable.
Broadstairs.



at Bruges.

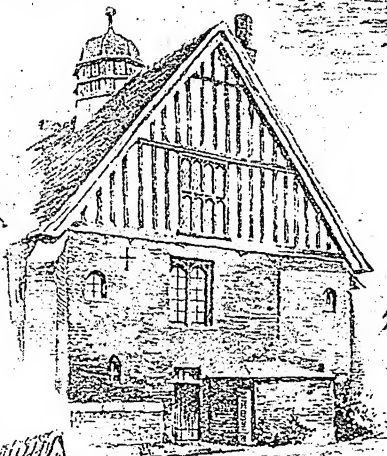


at Soissons
(Cath' Concept)

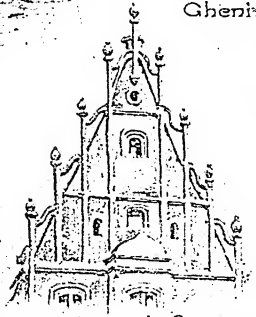


Gables at
Bruges.

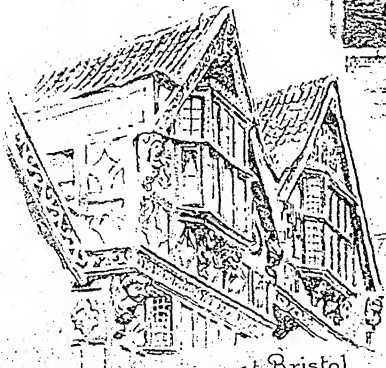
at Forcheim



Gables
at
Ghent

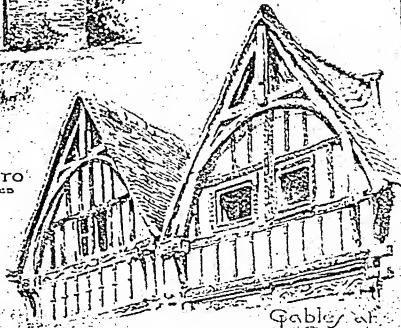


at Nuremberg.



at Bristol
(St Peter's Hospital)

at Gainsboro
Lincoln
(The Old
Hall)

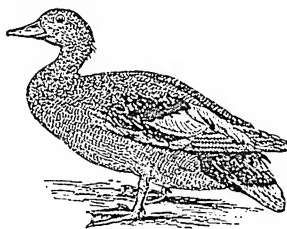


Gables at
Coep.

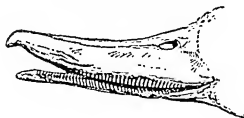
organist at a Surrey church, professor at Queen's College, Harley Street, London, and at the Guildhall School. His musical scores include symphonies, overtures, cantatas—some produced at the Crystal Palace and Philharmonic concerts—also church music (services and anthem). He published *Technical Method of Sight Singing* (1897).

Gadsden, JAMES (1788-1858), American soldier and diplomatist, was born at Charleston, S. Carolina, entered the army, and in 1818 was appointed aide-de-camp to General Jackson. He took part in the Seminole war. In 1853 Gadsden was sent as minister to Mexico, and the same year concluded the treaty which provided for the readjustment of the boundary between the two countries, and the acquisition by his government of Arizona and New Mexico.

Gads Hill, in the village of Higham, 4 m. N.W. of Rochester, Kent, England, was the scene of Prince Henry and Falstaff's robber escapades, depicted by Shakespeare in his drama of *Henry IV*. Charles Dickens died at Gads Hills Place in 1870.



Gadwall Duck.



Bill of Gadwall.

Gadwall (*Chaulelasmus streperus*), a duck which is a comparatively rare visitor to the British Isles, though it has been known to breed in Norfolk. It is a widely-distributed bird, occurring throughout Europe and N. America, as well as in Asia and the north of Africa. It is a freshwater species, and is remarkable for the great development of the comblike "teeth" at the margin of the bill.

Gæa, or **GE**, called **TELLUS** by the Romans, the earth-goddess. She is said to have been the first offspring of Chaos, and she was the mother of Uranus (Heaven) and Pontus (Sea). Then she was wedded to Uranus, and bore to him the Titans.

Gaelic Language and Literature. *Language.*—Gaelic includes Irish and Manx as well as Scottish Gaelic, although in popular usage it is commonly restricted to the last. Gaelic, together with the Brythonic language (*i.e.* Welsh, the extinct Cornish, and the dialects of Brittany); Gaulish, which survives in words and names preserved by Latin and Greek writers as well as in inscriptions on stone and coins; and the dialect of Galatia in Asia Minor, of which hardly a vestige remains, constitute the Celtic language, which is a member of the great Indo-European or Aryan family. Gaelic joins with Greek in substituting *n* for the Aryan *m* as the termination of the accusative singular, the genitive plural, and the dative dual of nouns and adjectives; but its nearest relative in the Indo-European family is Latin. Celtic presents several features in its structure which some scholars have attributed to external non-Aryan influences. At an early date the Gaelic branch lost the initial *p*: for example, *pater*, 'father,' appears as *ath(a)ir*. Again, Celtic has developed the habit of sounding two or more words, when they are closely connected grammatically, under one accent, and treating them, phonetically, as one word. Under this influence the prepositions and their pronominal objects have become permanently welded into one word—*leam*, 'with me,' *leat*, 'with thee'—forms which find their analogue in the Tartaric languages. To the same cause are due other anomalies, notably the mutations known as initial aspiration and eclipsis, which students find so perplexing. A further feature, common in the Semitic languages, but in the Aryan family peculiar to Celtic, is that of placing two nouns, one of which governs the other in the genitive case, under one accent, and treating the combination as a compound noun: *Cuchulainn*, 'the hound of Culann.'

The language was brought to Argyll (Scotland) by the Dalriadic colony which settled there in the beginning of the 6th century, but it was in the district at a much earlier date. The language became the speech of Strathclyde and Pictland. Gaelic continued to be the language of the Scottish court until Malcolm Canmore's day (1057-93), but from that time it has been slowly receding north and west. Of recent years a knowledge of English has penetrated into the remotest parts of the Highlands; but the old tongue is still spoken in corners of Aberdeen, Banff, Dumbarton, and Stirling, in considerable parts of Perth and Caithness, and over

the whole of Arran, Argyll, Inverness, Ross, and Sutherland. In 1901 the number of persons over three years of age able to speak the language was 230,206, of whom 28,106 spoke Gaelic only. Highland emigrants carried the language to America, Australia, and New Zealand. It flourishes vigorously in Canada, the only newspaper printed of recent years in Gaelic coming from Cape Breton. The language is largely preached in churches, but is not taught in the schools.

Gaelic encountered Welsh in Strathclyde, English in the Lothians, Pictish in the Central and North Highlands, and Norse in the isles and on the western and northern seaboard. Under the pressure of these external influences Scottish Gaelic has been affected in a variety of ways. It has received large additions to its vocabulary, it has suffered loss of inflections, and it has multiplied its dialects.

Literature.—The earliest Gaelic writings are found in Ireland, Wales, Devon, and Cornwall, cut on stone in the peculiar script known as Ogam. There is a continuous Gaelic literature from the 7th century. Much the greater part of this has been produced in Ireland. The memoranda in the *Book of Deer*, written in the 11th and 12th centuries, are the earliest specimens of Gaelic now existing which are known to have been written in Scotland. A collection of the works of Irish and Scottish poets made by the Dean of Lismore (1512-30) is the oldest ms. we now possess which differentiates Scottish Gaelic from the literary language of scholars and bards. The reformation effected a great cleavage between the Gaels of Scotland and the Gaels of Ireland in literature as in religion; but Scottish scholars continued to write in the old literary forms down to the middle of the 18th century, while, on the other hand, Duncan MacRae wrote the *Fernaig* ms. (1688-93) in the idiom of his native district of Kintail. The Gaelic mss. preserved in Scotland are, with one or two exceptions, deposited in the Advocates' Library, Edinburgh. They contain a fair representation of the literature. The Scottish collection is very defective in the historical department—a fact to be accounted for by the loss of such records as those of Iona and of the Council of Islay. On the other hand, it is exceptionally rich in medical treatises, which came from the libraries of the Macbeths or Beaton, who flourished as physicians in Islay, Mull, and Skye down to a late date. There are lives of saints, passions, homilies, and hymns. There are

versions (they cannot in any sense be called translations) of the heroic literature of antiquity—of the *Discidium Troje*, the Argonautic expedition, the *Thebaid* of Statius, and the *Pharsalia* of Lucan. In purely native literature there is a fairly full vocabulary, and a copy of the grammatical treatise compiled by the old Gaelic scholars. But the great bulk of the native section is taken up with the doings and imaginings of prehistoric times. Several of the legends treat of the old divinities of the race under the guise of early settlers in Ireland, their conflicts with each other, and later with the Gaels who eventually dispossessed them. But the more important tales deal with the affairs of the Gaels themselves. These group round two centres—the first at the commencement of the Christian era, when Cuchullin is the great national hero; and the second in the 3rd century, when Fionn MacCumhail is the principal figure. Fionn was the father of the Gaelic Homer, Ossian, after whom the heroic literature of the Gael came to be called Ossianic.

Gaelic printed literature dates from 1567, when John Carswell issued a translation of Knox's Liturgy. Until 1750 Gaelic publications were few, and were confined to religious works, versions of the Psalms in metre, catechisms, and confessions. In 1762-3 James Macpherson published *Ossian* in English, but the Gaelic text was not printed till 1807. In this work the old material is so entirely recast that one must regard Macpherson's *Ossian* as essentially modern. The *Sean Dana*, published by Dr. Smith in 1787, although not altered to the same extent, may be relegated to the same category. The genuine Ossianic ballads of manuscript and tradition were published in 1872 by J. F. Campbell in *Leabhar na Feinne*. The same author issued in 1860-2 his well-known *West Highland Tales*, which largely consist of heroic and folk tales. Of much the same class are five volumes of *Waifs and Strays*, edited by Lord Archibald Campbell (1889-95). By far the largest and most important section of modern Gaelic literature is what survives of the works of lyric poets who flourished from the 16th century to the present day. Much of their beauty lies in the harmonious diction and in the rhythmical movements and cadences of the lines. They abound in bold metaphor and happy imagery; they are charged with feeling, energy, and passion; and they show a fitting appreciation of the sublime and beautiful, especially in external nature. This body of verse is printed chiefly

in the following collections: *The Book of the Dean of Lismore* (trans. by MacLauchlin, 1862); The Fernaig Collection—Cameron's *Reliquiae Celticae* (1894); R. Macdonald's (1776), Gillies's (1786), A. and D. Stewart's (1804), Turner's (1833), Mackenzie's *Beauties of Gaelic Poetry* (1841); Sinclair's *Gaelic Bards* (1890-6); and *An Duanair* (1879). With one exception, Mary Macleod, the works of the most highly prized Gaelic poets have been printed in separate volumes—as, for example, John Lom Macdonald, Alexander Macdonald, Dugald Buchanan, Robert Donn Mackay, Duncan Ban Macintyre, William Ross, Allan Macdougall, John Morrison, William Livingston, and Neil Macleod. Original Gaelic prose shows to great disadvantage, both in quantity and quality, in comparison with Gaelic poetry. Apart from one or two volumes of sermons, a history of Prince Charles Stuart by John Mackenzie, a well-written history of Scotland by the Rev. Angus Mackenzie, and an excellent collection of Gaelic proverbs edited by Sheriff Nicolson, the bulk of it is scattered among periodicals. Among modern writers in this department Dr. Norman Macleod is easily first. Selections from this author's works have been printed in two volumes, under the title of *Caraid nan Gaidheal* (1868, 1901).

Several Gaelic dictionaries of value have been published, the best being Armstrong's (1825), the Highland Society's (1828), and Macbain's *Etymological Dictionary* (1896). There are also a number of grammars, the most useful of which are Stewart's (1812), Munro's (1843), and Forbes's (1848). See Pattison's *Gaelic Bards* (1866), Blackie's *Language and Literature of the Scottish Highlands* (1876), M'Neill's *Literature of the Highlanders* (1898), and Maclean's *Literature of the Celts* (1902) and *Literature of the Highlands* (1904).

Gærtnera, a genus of tropical shrubs belonging to the order Loganiaceæ. The best-known species is the beautiful Indian *G. racemosa*, which bears large, fragrant white flowers slightly tinged with pink.

Gaeta, fort. tn. and archiepisc. see, Campania, Italy, on the Gulf of Gaeta, 74 m. by rail N.W. of Naples. It is the ancient Portus Caeta. Pop. (1901) 5,625.

Gætulia, anciently the interior of N. Africa, lying to the s. of Mauritania and Numidia and the region s. of the Syrtes. Its inhabitants were of the Libyan race, the ancestors probably of the modern Berbers. The Gætulians were conquered by Rome in 6 A.D.

Gaff, a light fishing-spear with a fork or hook at the end used for landing fish in angling. A sort of boom used in fore-and-aft rigged ships for extending the upper end of sails is also called a gaff.

Gage, THOMAS (c. 1598-1656), English Roman Catholic missionary, traveller, and author, entered the Dominican order in Spain, and from 1625-37 laboured as a missionary in Central America, and in 1648 published *The English American*, a glowing but shrewd description of the Spanish W. Indies. Sent as chaplain to Venables in 1654, he was at the capture of Jamaica, where he died.

Gage, THOMAS (1721-87), English general, served in Flanders and America, and in 1759 was appointed governor of Montreal. He commanded the British forces in America at the outbreak of the war of independence.

Gagern, HEINRICH WILHELM AUGUST VON (1799-1880), German statesman, born at Bayreuth. As the leader of the popular movement (1848), he was chosen president of the Frankfurt first parliament, and bent all his energies towards effecting the union of Germany under a constitutional monarch, with the king of Prussia as emperor.

Gahanbars, the six annual festivals of the Parsees, each held for five days.

Gaia, VILLA NOVA DE, tn., prov. Oporto, Portugal, on the l. bk. of the Douro, 3 m. by rail s. of Oporto. It contains large storage vaults for port wine. Pop. (1900) 14,754.

Gaiety Theatre, London, was opened on Dec. 21, 1863, under the management of Mr. John Hollingshead. Its career opened with *On the Cards*, by F. C. Burnand, and *Robert the Devil*, a burlesque, by W. S. Gilbert. Comedy, operetta, extravaganza, and farce constantly succeeded each other. Madge Robertson (afterwards Mrs. Kendal) was Mr. Hollingshead's leading lady. Nelly Farren (d. 1904) was a 'principal boy' such as London had never previously seen. Irving and Edward Terry early appeared on the Gaiety boards, and its low comedian was J. L. Toole. Robert Reece was for many years writer-in-ordinary to the Gaiety. But its audiences owed their liveliest hours to H. J. Byron. In 1879 the whole Comédie Française visited England for the first time, and scored a great success at the Gaiety. The following year Madame Bernhardt returned with a specially selected company. Fred Leslie (d. 1892) was the next particular bright star of this theatre. The curtain fell for the last time in the old Gaiety on July 3, 1903. The theatre was rebuilt, and the

new Gaiety was opened on October 26 of the same year by Mr. George Edwardes with *The Orchid*, which ran for 559 nights, and was succeeded by G. Grossmith's *The Spring Chicken* in 1905. See John Hollingshead's *Gaiety Chronicles* (1898).

They like a light soil and abundant sunlight.

Gaimar, GEOFFREY (fl. 1140), poet, patronized by the court of Henry I. of England; wrote a history of England (*L'Estorie des Engles*), ending at the year 1100, in octosyllabic verse, published

agricultural implements are carried on. Castle Hill, a tumulus, is erroneously said to be the tomb of King Sweyn the Dane. The old hall is said to have been built by John of Gaunt. Gainsborough, which is the St. Ogg's of George Eliot's *Mill on the Floss*, gives its title to the earldom in the Noel family. Pop. (1901) 17,660.

Gainsborough, THOMAS (1727-88), English portrait and landscape painter, born in Sudbury, Suffolk. He set up (1743) for himself in Hatton Garden, London, painting portraits and landscapes. Being unsuccessful, he settled in Ipswich, where he obtained work through Philip Thicknesse, governor of Landguard Fort, afterwards his first biographer. At his suggestion Gainsborough moved to Bath in 1760, and soon became a fashionable painter. Gainsborough was one of the thirty-six original members (1768) of the Royal Academy; but being offended by the bad position given to his *Three Princesses* in 1784, he withdrew, and never exhibited again. In 1774 he left Bath, and settled in London. Gainsborough was the rival of Reynolds in portraiture, and of Richard Wilson in landscape. He, more than any other artist, should be called the father of modern English painting. Gainsborough's influence as first of the impressionists can be traced through all contemporary art—in Constable, in the middle-Victorian landscapists, in the Glasgow school, in the New English Art Club. The greatest colourist of the early British school, he was rapid and facile in execution, dignified and graceful in expression, absolutely true to life and nature, and essentially English in sentiment. He painted over three hundred canvases, of which two hundred and twenty were portraits. Among his sitters were George III., Pitt, Burke, Clive, Franklin, Sterne, Johnson, Garrick, Sheridan, Mrs. Siddons, and the Duchess of Devonshire. The portrait of the latter was exhibited in 1793, and was subsequently bought by Thomas Agnew and Sons for £10,065. The canvas was cut from the frame in their galleries by a thief in 1876, and was not recovered till April 1901. It is now in the possession of Mr. J. Pierpont Morgan. Among other Gainsborough portraits which have brought large prices may be mentioned his *Portrait of a Young Lady*, sold for £9,450 in 1903, and his *Duchess of Gloucester*, which brought £12,700 at Christie's in 1904. See Sir Walter Armstrong's *Thomas Gainsborough* (1894); Ruskin's *Modern Painters* (new ed. 1873); and Gower's *Gainsborough* (1903).



Gainsborough's famous 'Duchess of Devonshire,' mysteriously stolen in 1876, and recovered in 1901.
(From the Original Sketch.)

Gaillac, tn., dep. Tarn, France, on riv. Tarn, 13 m. s.w. of Albi; has trade in wine. It was built round a Benedictine abbey of the 10th century. Pop. (1901) 7,672.

Gaillardia, a genus of hardy American composite plants with large yellow or orange and purple flower-heads. Gaillardias are both annuals and perennials.

in 1888 by T. D. Hardy and C. T. Martin.

Gainesville, city, Texas, U.S.A., the co. seat of Cooke co., about 70 m. N.N.W. of Dallas. Pop. (1900) 7,874.

Gainsborough, mrkt. tn. and port on the Trent, Lincolnshire, England, 15 m. N.W. of Lincoln. Shipbuilding, engineering, seed-crushing, and manufacture of

Gairdner, JAMES (1828), English historian, born in Edinburgh, began life as clerk in the Public Record Office in 1846, and has edited or written *The Paston Letters* (1872-5, 1900, 1904); *Henry VII.*, in the English Statesmen Series (1889); *History of Richard III.* (1878; new ed. 1895); *Letters and Papers of the Reign of Henry VIII.* (1863), and also of *The Reigns of Richard III. and Henry VII.* (1858); *Studies in English History* (1881); *The Early Tudors* (1902); and *A History of the English Church in the 16th Century* [1902]. He has edited a great part of the *Calendar of State Papers of Henry VIII's Reign.*

Gairdner, Sir William Tennant (1824), Scottish physician, born in Edinburgh; was connected with the Royal Infirmary there (1846-62). In 1862 he was appointed professor of medicine in Glasgow University, retiring in 1900. He is hon. physician-in-ordinary to the King in Scotland. He has published *Clinical Medicine* (1862), *The Physician as Naturalist* (1889), and *The Three Things that Abide* (1903).

Gairloch, vil. 30 m. N.E. of Portree in Skye, Scotland; described by Hugh Miller in ch. xii. and xiii. of *My Schools and Schoolmasters* (1854). Pop. of par. (1901) 3,797.

Gaisford, Thomas (1779-1855), English scholar, and dean (1831-55) of Christ Church, Oxford, was born at Ilford in Wiltshire. He became regius professor of Greek at Oxford (1812). As curator of the Bodleian Library, he did much to improve that institution; but he is best known as the editor of classical authors (Herodotus, Euripides, Sophocles, Cicero). The 'Gaisford prize,' for proficiency in Greek verse and prose, was founded at Oxford in his memory (1856). His chief works were the *Lexicon of Suidas* (1834) and the *Etymologicon Magnum* (1848).

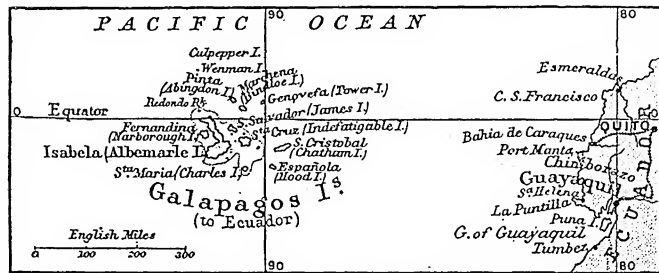
Gaisin, tn., Podolia gov., Russia, 136 m. E. of Kamenetz-Podolski. Pop. (1897) 9,393.

Gaius, Roman jurist, who lived during the reigns of Antoninus Pius and Marcus Aurelius (138 to 182 A.D.), was the author of several works, all lost, except the *Institutes*; these were discovered by Niebuhr in 1816 at Verona. Perhaps a tenth part of the work is still missing. The *Institutes* form the best introduction to a study of the principles of Roman law. Editions: Krüger and Studemund (4th ed. 1900); Poste (1890), with translation and notes. See Glas-son's *Etude sur Gaius* (1885).

Gaj, LJUDEWIT (1809-72), Croatian publicist, born at Krapina, and identified himself with the nationalist movements of his countrymen. He made an attempt to form a common literary

language, which he called Illyrian, by fusing the Servo-Croatian and Slovenish languages. He was the author of *Još Hrvatska nij Propala* (1833), and founded the nationalistic journals *Novine Hrvatske* (1835) and *Danica Ilirska* (1836). Gaš's best work was, however, a series of editions of the old Dalmatian classics.

Galactagogues, or **GALACTOGOGUES**, are agents which promote the secretion of milk. The



The Galapagos Islands.

most powerful of these is jaborandi, a South American drug, whose chief active constituent is pilocarpine. Many other substances, such as aromatic oils, senna, and other purgatives administered by the mouth, pass into the milk, and may to some extent stimulate secretion, but from their taste or their medicinal effect they are apt to disturb the child. The action of jaborandi, moreover, is only temporary; and of more importance than drugs in securing a good flow of milk is careful attention to the state of the patient's general health.

Galactodendron. See Cow-TREE.

Galago, the genus to which belong certain long-tailed lemurs, widely distributed throughout Africa. The galagos have large, naked ears, which can be folded so as to lie close to the sides of the head; the foot, too, is remarkably long. One of the largest species is *Galago crassicaudata*, the thick-tailed galago of Mozambique and the Lower Zambezi, which is about the size of a cat.

Galahad, in the Arthurian romances, is the son of Lancelot and Elaine. In the later Grail romances he replaces Perceval as achiever of the quest. See **GRAIL** and **LANCELOT DU LAC**.

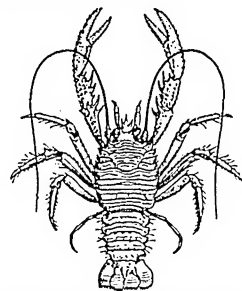
Galanthus. See SNOWDROP.

Galapagos, a group of about a dozen volcanic islands in the Pacific, 730 m. w. of Ecuador, to which they belong. The chief are Albemarle, James, Indefatigable, Narborough, Charles, and Chat-ham. Area, 2,400 sq. m. The flora and the fauna are alike peculiar. The fauna, differentiated in

the different islands, especially prompted and furthered Darwin's problem of the origin of species. Confined to the islands is a huge tortoise (*Testudo elephantopus*). Turtles of enormous size frequent the coasts. Of the twenty-five kinds of land birds described by Darwin, all but one are peculiar. Pop. 400. See Darwin's *Voyage of the "Beagle"* (1840-3), and Wolf's *Ein Besuch der Galapagosinseln* (1879).

Galashiels, parl. bur. and tn., Selkirkshire, Scotland, on Gala Water, 4 m. N.W. of Melrose; has woollen mills and hosiery factories. The manufacture of Scotch tweeds, to which the town owes its prosperity, was introduced about 1829. There is also a large tannery. Along with Hawick and Selkirk it returns one member to the House of Commons. Pop. (1901) 13,615.

Galata. See CONSTANTINOPLE.
Galatea. See ACIS.



Galathea, or Squat Lobster.

Galathea, a genus of decapod crustacea containing several common British forms, often called squat lobsters. The body is lobster-like, but is broad and somewhat flattened, the tail being habitually carried in a strongly bent position. The species of Galathea lie near the border-line between the long-tailed (macrurous) and short-tailed (brachyurous) decapods.

Galatia, anc. dist. of Asia Minor, consisting of parts of Phrygia and Cappadocia. It derived its name from the Galatæ.

or Gauls, who invaded and settled in Asia Minor during the 3rd century B.C. Augustus made Galatia a Roman province (see next article). The chief cities were Pessinus, Ancyra, and Tivium.

Galatians, THE EPISTLE TO THE, one of the four greater epistles of Paul. Its authenticity has never been questioned by any critic of the first rank. It was written to the churches in Galatia (ch. 1:2). Now Galatia may mean either (1) the district in Asia Minor inhabited by Gallic tribes, which Paul is supposed to have visited in his second missionary journey (Acts 16:6); or (2) the Roman province Galatia, which embraced the towns of Antioch, Iconium, Lystra, and Derbe, where Paul founded communities in his first expedition (Acts 13, 14). The prevailing opinion has been that the epistle was intended for churches in the former district (the N. Galatian theory); but of late the brilliant advocacy of Prof. W. M. Ramsay (cf. *The Church in the Roman Empire*, 7th ed. 1903; *St. Paul the Traveller*, 1895; *Com. on Galatians*, 1899) has gained much acceptance for the view that its destination was the churches in the southern part of the province (the S. Galatian theory). There seem to be good grounds for believing Galatians to be the earliest New Testament writing (c. 50 A.D.), and to have been written from Corinth. Its purpose was to oppose the propaganda of certain Jewish agitators who had been trying, not without success, to undermine the reputation and work of Paul. We can name only a few of the almost innumerable commentaries: Hilgenfeldt (1852), Ellicott (1854), Jowett (1859), Lightfoot (1865), Meyer (1870), Lipsius (1892).

Galatina, tn., prov. Lecce, Italy, 17 m. by rail s. of Lecce, with trade in oil, wine, and cotton. Pop. (1901) 14,086.

Galatz (Roum. *Galati*), tn., river port, and episc. see, Roumania, in Covurlui co., on the l. bk. of the Danube. It is built in the form of an amphitheatre; has iron, copper, candle, and soap industries; exports grain, meal, timber, and ships. But the trade is passing to some extent to Braila. Galatz is the seat of the Danube Commission. Here in 1789 the Turks defeated the Russians, and in 1828 the Russians the Turks. Pop. (1899) 62,678.

Gala Water, riv. of Scotland, rises in the Moorfoot Hills and flows s.e. into the Tweed about 3 m. w. of Melrose. Its total length is 21 m.

Galax, a one-species genus of plants belonging to the order Diapensiaceæ. *G. apophylla* is a dwarf-growing N. American per-

ennial plant with heart-shaped leaves, much used for decorative purposes, and small white flowers, borne in a spicate raceme at the apex of a tall leafless scape.

Galaxia, a genus of Cape bulbous plants belonging to the order Iridaceæ. The flowers are mostly yellow, the corolla being tubular at the base, but spreading out into limbs at the extremity of the petals. They are half-hardy, and in warm districts may be grown out of doors in sandy soil.

Galaxy, the Milky Way. One poetic legend identified it with the track of Phaethon; another with the ancient course of the sun, forsaken after the banquet of Thyestes. To American Indians, Patagonians, and Norsemen it figured as a ghostly high-road frequented by the dead; in mediæval folklore it became a way of pilgrimage, leading the Turks to Mecca, European peoples to Rome, Walsingham in Norfolk, or Santiago de Compostella in Spain. Hence the popular German appellation of the Galaxy as the *Jakobsstrasse*, and the Spanish *El Camin de Santiago*. See MILKY WAY.

Galba, SERVIUS SULPICIUS (B.C. 3-69 A.D.), emperor of Rome from June 68 to January 69. He had a distinguished career under Tiberius, Caligula, Claudius, and Nero, being prætor in 20 A.D., governor of Aquitania, consul in 33, governor of Gaul in 39, when he gained victories over the Germans, governor of Africa in 45 and 46, and of Hispania Tarraconensis from 61 to 68. After the murder of Nero he took the title of Caesar and went to Rome.

Galbanum, a yellowish-brown gum resin yielded by *Ferula galbaniflua* and other umbelliferous plants. It is imported from Persia and the Levant, in the form of tears or drops, agglutinated or separate, with a bitter taste and distinctive odour; and is used in medicine, internally as a carminative, externally as an irritant. It was known anciently as an ingredient of a perfume (*vide Exod.* 30:34).

Galcha, a term applied by the Persians in a social sense to the primitive hill tribes of the Hindu-Kush, the Pamir, and the uplands stretching thence N. to the head-waters of the Syr Daria (Jaxartes). These rude agricultural groups, which probably represent the aboriginal neolithic populations of the highlands between the W. and E. Turkestan lowlands, appear to have been largely Aryanized in speech in prehistoric times, and nearly all speak archaic forms of the Aryan mother tongue, which have recently been constituted a separate (provisional) member of the

Aryan family. The peoples of Galchic speech comprise the Yidoks of Chitral, the Siah Posh of Kafirstan, the Gors, Chilasi, and others of the Upper Indus basin, the natives of Sarakol, Wakhan, Shignan, Munjan, Sanglich, and Ishkashim, with all others of the Zerafshan basin, except the Yagnobis of non-Aryan speech. The physical type is the so-called 'Alpine,' especially in its pronounced brachycephaly (short round head with cephalic index over 86), tall stature, brown, gray, and even blue eyes, *never oblique*, the long and slightly arched nose, oval face, and generally regular features. Topinard declares the Galcha and the Auvergnat skulls to be identical, while De Ujfalvy calls the Kohistan (Hindu-Kush) highlanders 'belated Savoyards.' See Topinard, *Revue d'Anthropologie* (1878), p. 706; Robert Shaw, in *Jour. Assoc. Soc.*, vols. xiv. and xlv.; P. Tomaschek, *Die Pamir-Dialekte* (1882); J. Van den Gheyn, *Les Langues de l'Asie Centrale* (1884); Biddulph, *The Tribes of the Hindoo Koosh* (1880); Ch. de Ujfalvy, *Les Aryens au Nord et au Sud de l'Hindou-Kouch* (1896).

Galdos, BENITO PEREZ. See PEREZ GALDOS.

Gale. See STORM.

Gale, JAMES (1833), English inventor and electrician, born near Plymouth; lost his sight at seventeen, but has been very successful as a medical electrician and inventor. He is founder of the South Devon and Cornwall Institution for the Blind. See J. Plummer's *The Story of a Blind Inventor* (1868).

Gale, THEOPHILUS (1628-78), English nonconformist divine, born at Kingssteignton, Devonshire; preacher at Winchester Cathedral (1657). Refusing to comply with the Act of Uniformity, he was ejected. He was afterwards tutor to Lord Wharton's sons (1661-6), and finally preacher at a dissenting chapel in Holborn. In his *Court of the Gentiles* (1669-77) he traces all languages to Hebrew. He also wrote *A True Idea of Jansenisme* (1669).

Gale, NORMAN ROWLAND (1862), English poet and reviewer, born at Kew. His earlier poems, which were issued between 1888 and 1891, include *Anemonies*, *Cricket Songs*, *Meadowsweet*, and *Violets*. Two series of charming lyrics, under the title of *A Country Muse*, followed in 1892, and his later volumes include *Orchard Songs* (1893), *A June Romance* (1894), *Songs for Little People* (1896), *Barty's Star* (1903), and *More Cricket Songs* (1905).

Gale, THOMAS (?1635-1702), English classical scholar and an-

tiquary, born at Scruton, Yorkshire; became successively master of St. Paul's School (1672-97) and dean of York (1697-1702). He was regius professor of Greek at Cambridge (1666-72), and first hon. secretary of the Royal Society.

Galeandra, a genus of deciduous, terrestrial, tropical American orchids. They are best grown in peat in the East Indian house. They should be liberally supplied with water, and be thoroughly syringed every day. Among the most beautiful species are *G. nivalis* and *G. Baueri lutea*.

Galega, or GOAT'S RUE, a genus of hardy leguminous plants with white or blue papilionaceous flowers borne in racemes. The leaves are pinnate, and the leaflets entire. The most common species is *G. officinalis*, a blue-flowering plant about four feet high, with its beautiful white variety, *G. o. alba*.

Galen (130 to about 200 A.D.), ancient physician, whose full name was Claudius Galenus; was born at Pergamos in Asia Minor. In 163 or 164 he went to Rome, and gained great renown in that city, and attended the Emperors M. Aurelius and L. Verus at Aquileia. His life was then spent alternately at Rome and Pergamos. The date of his death is unknown. For many centuries his writings formed the chief text-book of the medical profession. He was especially distinguished in anatomy, diagnosis, and prognosis. Edition: Marquardt, Müller, and Helmreich (in Teubner's Series, 1884-92). See J. Finlayson's *Galen* (1895); J. F. Payne's *Harvey and Galen* (1897); and Maillard's *Aperçu Historique sur Galen et ses Ouvrages* (1865).

Galena, or LEAD-GLANCE, is the naturally occurring sulphide of lead, PbS, and forms the source from which the metal lead is almost entirely obtained. Galena is very widely distributed, and occurs in heavy (sp. gr. 7.5) cubic crystals of a bright lead colour, that are brittle (h. = 2½), and readily cleave into smaller cubes. It is somewhat volatile and easily oxidized, lead being set free under suitable conditions. Galena often contains antimony, gold, and silver. See LEAD.

Galena. (1.) City, Illinois, U.S.A., the co. seat of Jo Daviess co., 15 m. E.S.E. of Dubuque, Iowa. It has valuable lead mines, and was for a short time the home of President Grant. Pop. (1900) 5,005. (2.) City of Cherokee co., Kansas, U.S.A., in a lead and zinc region, about 160 m. S.E. of Topeka. Pop. (1900) 10,155.

Galeodes, the name of a genus of Solifuge, an order of arachnids sometimes called 'false spiders' or 'scorpion spiders.' The

species are abundant in hot countries, and are poisonous animals. In S. Russia *G. araneoides* is common; there is also a Grecian species (*G. græcus*), while another occurs in Portugal. An obvious distinction from spiders is the fact that both thorax and abdomen are segmented.



Galeopithecus.

Galeopithecus, the generic name of certain mammals from the Malayan region, commonly, though incorrectly, called flying lemurs. The two species of *Galeopithecus* are now placed in a sub-order of Insectivora, and regarded as the vegetarian analogues of the insect-eating bats. The common species, *G. volans*, is about the size of a cat, and, like its ally, *G. philippinensis*, has a flying-membrane or parachute, which involves the anterior and posterior limbs and tail, but is quite different from that of the bats. The teeth are remarkable, the lower incisors being comb-like, while the upper outer incisor at each side has two roots. The animals inhabit forests, and feed upon leaves and fruit. Though incapable of true flight, they can take long flying leaps, with a descent of about one in five.

Galeopsis, a genus of hardy annual labiate plants, easily cultivated in gardens. The best species is *G. versicolor*, which in July and August bears yellow flowers, with a characteristic reddish spot on each. The common hemp-nettle is *G. tetrahit*.

Galeotto Principe, a name given to Boccaccio's *Decameron*.

Galerites, also known as ECHINOCONUS, a sea-urchin characteristic of the Cretaceous system, and ranging from the Upper Greensand to the Upper Chalk. It is somewhat conical or helmet-shaped, and, as usually found, is smoothly rounded, the spines attached to the living animal having fallen off. Its under surface is flat, and the shell is oval or pentagonal in outline. The mouth is in the centre of the base, the anal aperture near the hinder edge of the shell.

Galerius. See MAXIMIANUS (No. 2).

Galesburg, city, Illinois, U.S.A., co. seat of Knox co., 85

m. N.W. of Springfield. It has railway shops, stockyards, brick-making works, boiler and engine shops. Pop. (1900) 18,607.

Galgacus, chieftain of the Caledonian tribes, who in 84 A.D. resisted Agricola's invasion of Scotland, but was defeated in a great battle near the Grampian mountains; the exact battlefield is unknown.

Galiani, FERNANDO (1728-87), Italian writer on political economy, born at Chieti; won a reputation almost simultaneously as a wit and a political economist by his *Trattato della Moneta* (1750), and *Componimenti Varii per la Morte di Boia Jannacone* (1749), a parody of contemporary Neapolitan literature in the shape of discourses on the death of the hangman. His next work was *Dialoghi sul Commercio del Grano* (1770). He held the post of minister of the royal domains (from 1777). See Alberto Margheri's *L'Abate Galiani* (1878); also *Correspondance inédite de Galiani, 1765 à 1783, avec MM. d'Epinay, d'Holbach, Grimm, Diderot, etc.* (1818; new ed. 1881); and Dessein's *Galiani et la Question de la Monnaie au XVIII^e Siècle* (1902).

Galiano, ANTONIO ALCALA (1789-1865), Spanish orator, politician, and man of letters, born at Cadiz. He was Liberal leader (1820-4) in the struggle against the reaction under Ferdinand VII., and was then (1824-30) an exile in London, his writings showing strong signs of English influence. Galiano's *Memoirs* are interesting, but his best work is *Historia de la Literatura española, francesa, inglesa, e italiana, en el Siglo XVIII* (1845).

Galicia. (1.) Crown land of Austria, lies on the N. side of the Carpathians. Its N.W. frontier is formed by the Vistula; its E. parts are drained by the Dniester, Pruth, and Sereth. Apart from the manufacture of spirits and the extraction of petroleum, ozocerite, salt, and a little coal, there is scarcely any industry. The country exports timber extensively, but agriculture is backward. So also are the people, both educationally and socially. Over fifty-three per cent. are Poles, and forty-three per cent. Ruthenians. Total area, 30,307 sq. m. Pop. (1900) 7,315,939. Chief town, Lemberg. (2.) Ancient kingdom, N.W. Spain, bounded on S. by Minho R., on N. by Bay of Biscay, and on W. by Atlantic Ocean. Now consists of the modern provinces of Pontevedra and Corunna.

Galicz. See HALICZ.

Galignani, JOHN ANTONY (1796-1873) and WILLIAM (1798-1882), publishers of *Galignani's Messenger*, issued daily at Paris

in English, were both born in London, of Italian parentage. The *Messenger*, founded in Paris by their father in 1814, was carried on by the brothers after 1821, but ceased to appear in 1904. A home for Englishmen in need was founded at Corbeil, near Paris, by the brothers Galignani.

Galilee, a term applied to a porch or external chapel attached to a church, and used by persons (e.g. penitents) not admitted to the church itself, being sometimes assigned to women, where, as at Durham, these were excluded from the general services. The chief English examples are at Durham (a gem of architecture), Ely, and Lincoln.

Galilee, province and lake of Palestine in the time of our Lord. (1.) PROVINCE. Originally the Galilee of the Gentiles lay

the lake, on the heights (2,300 ft.) over the Yarmuk.

Galilei, GALILEO (1564-1642), Italian astronomer and physicist, born at Pisa. While a student he had enunciated the law of vibrations or swings of a pendulum—i.e. its isochronism (1583). In 1588 he was provided with a lectureship at Pisa University. At this period he invented the hydrostatic balance. Owing to the veiled suspicion and hostility of the ecclesiastics and the loss of court favour, he quitted Pisa (1591), and obtained the professorship of mathematics in Padua University (1592-1610). In 1609 he constructed a telescope, on the model of that of Hans Lippershey of Middelburg in Holland, and with it discovered four satellites of Jupiter, as well as the fact that they were not stationary, but actually revolved around

VIII. Stricken in years, and dreading imprisonment, Galileo publicly abjured his own philosophy. Accused of heresy, he was, among other penalties, to suffer detention, while his book was prohibited. At the close of 1633 he was allowed to return to Arcetri, Florence, where he lived in seclusion until his death. An edition of Galileo's works and correspondence, including what is perhaps his most important production, *Dialogues of the New Sciences* (first pub. 1638), is in course of issue by the Italian government (since 1890). See *Lives* by Viviani (1654), T. Henri Martin (1868), Favaro (1882), and Fabie (1903).

Galion, city, Crawford co., Ohio, U.S.A., 15 m. s.w. of Mansfield; has railway shops, carriage factories, and iron works. Pop. (1900) 7,282.

Galitzin, also GALLITZIN, GOLIZYN, and GALIZYN, a prominent family of the Russian nobility. Among the most important were:—(1.) VASIL VASILJEVITCH, surnamed 'the Great' (1643-1713), head of the army and keeper of the great seal under Sophia, sister of Peter the Great. His fall, caused by his ambition to obtain the crown, was followed by banishment to the far north. (2.) MICHAEL MICHAELOVITCH (1674-1730), won distinction in the wars of Peter the Great against Turkey and Sweden, and especially by the conquest of Finland (1714). (3.) DIMITRI ALEXEEVITCH (1735-1803), who served as Russian ambassador to the Hague and Paris, where he formed friendships with Voltaire and the Encyclopédistes. He is most widely known through his wife, ADELHEID AMALIE (1748-1806), daughter of Count von Schmettau, a Prussian general. She gathered, at various times, Goethe, Jacobi, Fürstenberg, Hemsterhuis, and Hamann in her house at Münster, where she settled after separating from her husband. See Galland's *Die Fürstin A. von Galitzin u. ihre Freunde* (1880). (4.) DIMITRI AUGUSTINE (1770-1841), born at the Hague, son of Dimitri Alexeevitch, became a Roman Catholic priest in America, where he was known as 'Father Smith.' He was vicar-general of Philadelphia, and wrote several volumes, the principal of which were *Defence of Catholic Principles* (1816), *Letter to a Protestant Friend* (1820), *Appeal to the Protestant Public* (1834). See *Life* by Heyden (1847). (5.) NIKOLAI SERGIEVITCH (1808-92), lieutenant-general in the Russian army, the author of a *History of War* (Ger. trans., *Kriegsgeschichte seit den ältesten Zeiten* (13 vols. 1874-89) and other historical works.



Galilee.

between Esdraelon (which it comprised on the south) and the river Kasimiyeh or Leontes on the N., the Maritime Plain on the W., and the Lake of Galilee, whose E. shore it included. Exclusive of that it measured about 50 m. N. and S. by 25 to 35 E. and W. The chief thoroughfare is the so-called Way of the Sea, connecting Damascus with the Mediterranean. (2.) LAKE OF GALILEE, SEA OF TIBERIAS, or LAKE OF GENNESARET, lies in a chasm 680 ft. below the level of the sea. It is liable to sudden and violent storms, and is nearly 13 m. long by 8 broad. On the W. lay Tiberias, the new capital of Herod Antipas, also Magdala on Gennesaret, Capernaum, and Chorazin. On the E. of Jordan was Bethsaida, and down the E. shore lay Gergesa and Hippos, one of the Decapolis. Gadara lay S.E. of

the bright planet. The uneven configuration of the surface of the moon was demonstrated; and he detected sun-spots. The astronomer was invited to Florence (1610) by his patron, Cosimo, Grand Duke of Tuscany, and established as his philosopher and mathematician. Continued advocacy of Copernican principles, and disquisitions on their Scriptural significance, brought him under the ban of the church, and he was cited to appear before the Inquisition (1616). The Holy Office decreed the new theory of the solar system to be philosophically absurd, and bade him discontinue his teaching; at the same time, Copernicus's book on the subject was interdicted. In 1632 appeared his *Dialogues on the Systems of the World*, after which he was peremptorily summoned to Rome by Pope Urban

Galium, a genus of hardy annual and perennial plants belonging to the order Rubiaceae. There are several British species, including *G. verum*, the yellow bed-straw, which may be recognized by its whorls of thread-like leaves, and its panicles of small yellow flowers in late summer; *G. mollugo*, the hedge bed-straw, which bears loose panicles of white flowers in late summer; and *G. aparine*, the goose-grass or cleavers, whose trailing stems, leaves, and seed-vessels cling to the clothes. It bears tiny white axillary flowers in summer.

Gall, or **GALLUS**, ST. (A.D. 551-646), a saint of Irish origin, often called 'the apostle of the Alomani,' was a pupil of St. Columba at Bangor in Ireland; then settled near Lake Constance; the Swiss canton and town take their name from him.

Gall, FRANZ JOSEPH (1758-1828), German physiologist and founder of phrenology, born near Pforzheim in Baden. Established as a physician in Vienna (1785), he began his phrenological researches, the results of which he embodied in lectures, whose continuance was, however, forbidden by the government in 1802. In 1807 he settled as a physician in Paris, where he remained till his death. His *Introduction au Cours de Physiologie du Cerveau* (1808) was followed by *Recherches sur le Système Nerveux . . . et celui du Cerveau* (1809), and the first part of *Anatomie et Physiologie du Système Nerveux . . . et du Cerveau* (1810-20), the two latter works bearing also the name of Spurzheim. A reprint of a portion of this, bearing the name of Gall alone, was issued in 1825 (Eng. trans., 6 vols., *On the Functions of the Brain and each of its Parts* 1835). His *Des Dispositions Innées de l'Âme et de l'Esprit* (1812) was written in answer to charges of materialistic teaching brought against him. Small as is the ultimate value of Gall's phrenological ideas, his books helped to direct scientific attention to the brain and its functions. See *Life* by Jessie Fowler (1896).

Gallait, LOUIS (1812-87), Belgian painter, born at Tournai. He first achieved fame through his pictures, *Render unto Caesar the Things which are Caesar's* (1832), and, in 1833, *Christ Healing a Blind Man* (in the cathedral of Tournai). He was afterwards very successful in Paris as a historical and portrait painter. His chief historical works are *The Abdication of Charles v.* (1841), *Edmont Preparing for Death* (1848), *Alva Looking upon the Bodies of Edmont and Horn* (1851), *The Last Moments of Count Edmont* (1858), and *The Plague of Tournai* (1882).

Galland, ANTOINE (1646-1715), French Orientalist and archaeologist, born at Rollet (Picardy); was attached to the French embassy at Constantinople (1670); in 1673 travelled to Syria and the Levant, and made other expeditions to the East in 1676 and 1679. In 1704-17 he published *Les Mille et Une Nuits*, the first European translation of the *Arabian Nights*, which remains the standard French version. Among his other works is *Paroles Remarquables, Bons Mots, et Maximes des Orientaux* (1694). See his *Tagebuch . . . 1672-3*, ed. by Schefer (1881).

Galla-ox, or **SUNGA**, a humped domesticated form of ox kept in Abyssinia and the adjacent Galla countries. It has exceedingly thick horns, and is probably a variety of *Bos indicus*.

Gallarate, tn., N. Italy, prov. Milan, 25 m. N.W. of city of Milan by rail; has cotton and linen factories. Pop. (1901) 11,952.

Gallas, a branch of Ethiopic Hamites, ranging from Abyssinia in the N. to the Tana River in the S. Many are warlike nomads, rearing cattle and horses. They are tall and muscular, and though thick-lipped and brown-complexioned, their features point to a Caucasian origin. Their women used to fetch high prices in the great African slave markets, Cairo and Khartum. A few are still pagans, but the great majority have long been Mohammedans, while in the north a considerable number (Sidamas) belong to the Monophysite Church of Abyssinia. The total number of Gallas is estimated by Krapf at from six to eight millions.

Gallas, MATTHIAS, COUNT (1584-1647), imperialist general in the Thirty Years' war, born at Trent in Tyrol. He served successively with the Spanish in Savoy (1617), under Tilly against Christian IV. of Denmark (1625), and in Italy (1629), when he laid waste Mantua. When Wallenstein was denounced to the emperor, Gallas was appointed to command the army in his place. At Nördlingen (1634) he inflicted a crushing defeat on Duke Bernhard of Saxe-Weimar, and restored to the emperor a preponderating influence in Germany. In 1637 he drove the Swedes under Banér back to Pomerania, but in 1643 he unsuccessfully opposed Torstensson.

Gallatin, ALBERT (1761-1849), American statesman, born at Geneva; emigrated to the United States in 1780. He was elected to Congress (1795), where he rapidly rose to the head of the republican opposition, and was secretary of the Treasury (1801-13) under the presidency of Jefferson. On the declaration of war with Britain in 1812, the

negotiations of the British and American commissioners at Ghent in Belgium were brought to a favourable issue largely through his instrumentality. A diplomatic mission to France (1816-23), and two years spent in England upon a similar undertaking (1826-8), completed the public life of Gallatin. He published *Synopsis of the Indian Tribes . . . in N. America* (1836), and *Semivilized Nations of Mexico, Yucatan, and Central America* (1845). A collected edition of his works appeared at Philadelphia (1879). See *Lives* by Adams (1879), J. A. Stevens (1883), and Henry Cabot Lodge (1879).

Gallaudet, THOMAS HOPKINS (1787-1851), teacher of the deaf, born at Philadelphia. He was sent to Europe (1815) to acquire a knowledge of the art of instructing the deaf. This he obtained at Paris from the Abbé Sicard, De l'Épée's successor. Returning to America in 1816, accompanied by Laurence Clerc, an educated deaf-mute, in April 1817 they opened school at Hartford, which in a few years developed into the great school of the American Asylum for the Deaf. Gallaudet was principal of this school until 1830.

Gallaudet, EDWARD MINER (1837), son of preceding, born at Hartford, Connecticut; founder (1864) and principal of the National College for Deaf-mutes, now Gallaudet College, at Washington, D.C.

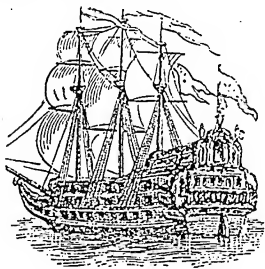
Galle (formerly Point de Galle), seapt. on the S.W. coast of Ceylon, 66 m. S. by E. of Colombo; was for long the chief port of the island, but since the transference of the shipping traffic to Colombo trade has much declined, though cocoa-nut, plumbago, and tea industries have arisen in the district. Pop. (1901) 37,248.

Galle, JOHANN GOTTFRIED (1812), German astronomer, born near Wittenberg; in 1835 he was appointed to a post at the Berlin observatory. From 1851 to 1895 he was professor of astronomy and director of the observatory at Breslau. His observations included the actual discovery (Sept. 23, 1846) of the planet Neptune, whose existence had been asserted by Leverrier, and of three comets. He also turned his attention to meteorological research. In 1857 he published *Grundzüge der Schlesischen Klimatologie*; in 1879, *Mitteilungen der Breslauer Sternwarte*; and in 1894, *Verzeichnis der bisher berechneten Kometenbahnen*.

Gallego, the Spanish name for the cold piercing north and north-west wind that blows from Galicia. The name is also applied to the natives of Galicia.

Gallenga, ANTONIO CARLO NAPOLEONE (1810-95), Italian publicist, was born at Parina. Involved as a student in the revolutionary movement of 1830, he was imprisoned, but escaped, and settled in London as a translator and writer. At the time of the Italian revolution of 1848 he was agent for Piedmont at Frankfort-on-the-Main; and he served as deputy in the Italian Parliament (1854-64). From 1859 to 1879 he was on the *Times* staff. Gallenga's chief works, written in English, are: *History of Piedmont* (1855), *Country Life in Piedmont* (1858), *Italy Revisited* (1875), *The Pope and the King* (1879), *Italy, Present and Future* (1887).

Galleon, a name formerly given to Spanish ships of war with three or four batteries of cannon, and later was applied to the largest Spanish merchant ships, usually with four decks. Two fleets sailed every year from Spain—one to Mexico, and the other to Peru. The former were called 'the flota,' and the latter 'the galleons.'

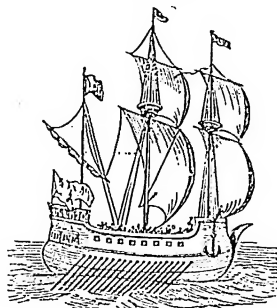


Galleon.

Gallery means (1) any large room which is of considerably greater length than breadth; (2) earlier, however, it exclusively meant a passage, raised some height from the floor, from which one could look down into the building, but was not necessarily fixed against the containing walls, the most frequent early examples being the *rood-lofts* (see *ROOD*) in churches. The fashion of putting wooden galleries in churches to increase space came in after the reformation. See also *MINING*.

Galley, a low, flat-built vessel furnished with one deck. The galley, apart from having been used by the Romans, was mainly employed by the Genoese, Pisans, and Venetians. The Venetian galley was generally three-masted, and was sometimes 160 ft. long, 32 ft. broad, and supplied with sixty-four oars, to each of which were chained six or seven slaves. Such galleys were provided with powerful

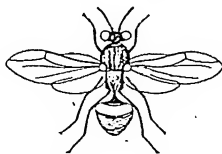
rams, upon which they mainly relied for their offensive power, and carried from 400 to 500 men. Criminals in France and else-



Galley.

where were frequently condemned to serve at the oars in these craft. In its modern sense galley has two meanings: (1) the common kitchen of a ship; (2) the fastest pulling boat of a ship of war, generally appropriated to the use of the captain or the admiral.

Gall-flies, a name applied to the members of the family Cynipidae, which are not flies, but are related to ants and bees (order Hymenoptera). It should, however, be noticed that not all members of the family produce galls, and that a number of other insects, as well as some mites, also give rise to galls. As an example of a gall-fly, the life-history of *Rhodites rosæ* may be given. The minute adult female selects in spring a leaf-bud of the wild rose, and by means of her ovipositor (= sting of the bee) pricks the bud in three places. As the eggs introduced at the punctures develop into larvæ, these larvæ seem to exercise some peculiar influence on the growing tissue, with the result that it does not give rise to stem and leaves, but to the red much-branched structure which forms the bedeguar gall. Within the gall is a series of chambers containing larvæ. In this, as in many other cases, however, there is much difficulty



Gall-fly.

in distinguishing between the larvæ which make the galls and guest or parasitic larvæ which feed upon the substance of the gall or upon the tissues of the first inhabitant. Still another

complication arises from the fact that there is distinct alternation of generations in some gall-flies, the two forms not only differing from one another in appearance, but also producing different kinds of galls. The common oak-gall is *Cynips folii*, but the maggot found within an oak-gall may not be the larva of this form, but of a very common parasite of the same family, known as *Torymus regius*.

Gallia, the country of the Gauls, embraced two regions—Gallia Cisalpina or Citerior, and Gallia Transalpina or Ulterior. The latter, the real home of the Gauls, included the whole of modern France and Belgium, and parts of Holland, Germany, and Switzerland. The Romans began to conquer Gaul about 125 B.C., and in 121 formed the province of Gallia Narbonensis, called simply Provincia (hence the modern Provence), in the S.E. of Gaul. Between 58 and 50 B.C. Julius Cæsar conquered the rest of Gaul, which was then divided into three parts—viz. *Aquitania*, between the Pyrenees and Garonne; *Celtica*, between the Garonne and Seine; and *Belgica*, N. of the Seine. Augustus divided Gaul into four provinces—viz. *Narbonensis*, the original province; *Aquitania*, from the Pyrenees to the Loire; *Lugdunensis*, the country between the Loire, Seine, and Saône; and *Belgica*, between the Seine, Saône, and Rhine. Gallia Cisalpina was the name given to the north of Italy, between the Apennines and the Alps, which was occupied by Gallic invaders probably in the 5th or 6th century B.C. After the first Punic war the Romans conquered the country and made it a province, though it was not until the defeat of the Boii in 191 that the conquest was secure. See Holmes's *Cæsar's Conquest of Gaul* (1899), and C. Jullian's *Gallia* (2nd ed. 1902).

Galliard, a dance tune; also a dance for two persons, common in the 16th and 17th centuries. It is said to have been the parent of the minuet.

Galliate, tn., prov. Novara, Italy, 5 m. by rail N.E. of Novara. Pop. (1901) 9,056.

Gallic Acid, one of the six possible trihydroxybenzoic acids, $C_6H_2(OH)_3COOH$, and is a constituent of gall-nuts, sumach, divi-divi, etc. It can be prepared by boiling its glucoside tannin with dilute acids, and is obtained in the form of white, silky, astringent needles, soluble in water, giving an acid solution which precipitates ferric salts, but not gelatin. It is a powerful reducing agent, forms numerous gallates, and when heated to 215° C. yields pyrogallol.

Gallican Church, a name applied to the Church of France with regard to its former resistance to the advanced claims of the Pope; hence 'Gallicanism' as an attitude of comparative independence towards the authority of the pontiff. The Gallican principles were expressly embodied in the Pragmatic Sanction of St. Louis (1269), and the struggle became acute for a time under Philippe le Bel. In 1682 the Gallican feeling reached its highest point, when the celebrated four propositions or declarations of the French clergy, drawn up by Bossuet, were signed at Paris by thirty-five bishops and thirty-five other clergy. The propositions were to the effect that (1) kings and princes are not subject to the ecclesiastical power in temporal

changes have extended the function of the state towards the church. See W. H. Jervis's *History of the Church of France* (1872), and *The Gallican Church in the Revolution* (1882).

Gallieni, JOSEPH SIMON (1849), French soldier, commander-in-chief in Madagascar, was born at Saint-Béat (dep. Haute-Garonne), and after serving in the Franco-German war, and with the French expeditions in the basin of the Upper Niger (1877-81), succeeded Laroche in the new French colony of Madagascar in 1896, where he succeeded to some extent in suppressing the internal disaffection of the island. He has published *Mission d'Exploration du Haut Niger, 1879-81* (1883); *Deux Campagnes au Soudan Français* (1890). See Ellie's *Le Général Gallieni* (1900).



Ancient Gaul.

affairs, and cannot be deposed by it; (2) the Pope's power is limited by the decisions of general councils, as well as (3) by the canons of the universal church, and the rules, customs, and institutions of the French kingdom and church; (4) the Pope's judgment in matters of faith is not final unless it is supported by the whole church. These declarations were condemned between 1690 and 1800 by Alexander VIII., Clement XI., and Pius VI. successively. After the revolution, Napoleon at first (in 1801) concluded a concordat with the Pope, but in 1810 he reaffirmed the condition created by the declarations. In 1813 Pius VII. was compelled to sign (though he afterwards repudiated it) the concordat of Fontainebleau, which did not recognize his right to institute bishops. Later

Gallienus, PUBLIUS LICINIUS VALERIANUS EQUATIS, Roman emperor, son of Valerian, was associated with his father in the government in 253 A.D. In 260, when Valerian was captured by the Persians, Gallienus became emperor, and reigned until 268 A.D. During his reign numerous usurpers, known as the Thirty Tyrants, sprang up; and while besieging one of these, Aureolus, in Milan, he was murdered by his soldiers.

Galliffet, GASTON ALEXANDRE AUGUSTE DE, MARQUIS DE (1830), French general, born at Paris. He served in the Crimea, Italy, and Mexico; in the Franco-German war made a brilliant cavalry charge at Sedan; won a reputation for harshness in his treatment of the communists; commanded in Algeria (1872); and

was minister of war in June 1899 in the cabinet of Waldeck-Rousseau, but resigned in May 1900, after having carried the government safely through the Dreyfus crisis. See his *Mes Souvenirs*.

Gallinaceous Birds, or GALLIFORMES, constitute a large order of ground-birds, game-birds, or Galli. The order Galliformes is divided into four sub-orders: (1) Mesites; (2) Turnices; (3) Galli; (4) Opisthocomi. The first has been constituted for some curious birds from Madagascar. To the Turnices belong the hemipodes, called bustard-quails or button-quails by Anglo-Indians. The Galli include the megapodes, also called mound-builders and brush-turkeys, the carassows and guans, the guinea-fowls, turkeys, pheasants, partridges, and grouse. Finally, the sub-order Opisthocomi has been created for the very curious hoatzin of S. America.

Gallio, the proconsul of Achaia 53-54 A.D., mentioned in Acts 18:12-17. He was a brother of Seneca, and uncle of Lucan, and ultimately fell a victim (by compulsory suicide) to the savagery of Nero. His name has become a synonym for easy-going indifference.

Galliot, a Dutch vessel generally used for fishing, and carrying a mainmast and a mizzenmast, and a large gaff-mainsail. Also a small galley, a kind of brigantine, built for pursuit, and propelled by both sails and oars.

Gallipoli. (1.) Seaport, vilayet Adrianople, Turkey in Europe, on E. coast of peninsula of same name. It is the see of a bishop of the Greek Church. Here, in 1294, the Venetians were defeated by the Genoese; but in 1416 they won a naval battle here over the Turks. Pop. (largely Greek) estimated at 30,000. (2.) Seaport tn. and episc. see of Italy, prov. Lecce, on the Gulf of Taranto. It carries on tunny-fishing, and exports olive oil. Pop. (1901) 13,459.

Gallium (Ga, 70), a rare metal discovered spectroscopically in 1875 by Lecoq de Boisbaudran, in the zinc blende of Pierrefitte, Hautes-Pyrénées. It is a hard, grayish-white metal, of specific gravity 5.9, melting at 29.5° C., and remaining liquid at lower temperatures, unless touched by a crystal of the metal. It is the only metallic element, besides mercury, which can be liquid at ordinary temperatures. Gallium belongs to the aluminium group, is the eka-aluminium predicted by Mendeléeff, and forms two series of compounds in which it appears as divalent and trivalent.

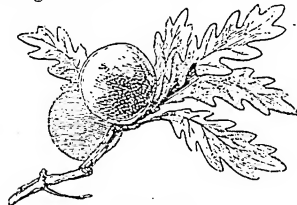
Gall-midges are minute flies belonging to the order Cecidomyiidae, which feed upon plant tissues, and often produce galls

or deformities on plants. The species of greatest economic importance is the Hessian fly. Zoologically, the gall-midges are important because some species are capable of reproduction while retaining the larval form, this precocious reproduction taking place apparently by a kind of internal budding.

Gallon, an English measure of capacity containing four quarts. Various gallons seem to have been formerly used, but in 1689 the wine gallon was declared by law to contain 231 cubic inches, and this is the present standard in America. The imperial gallon now in use contains 10 lbs. avoirdupois of distilled water, or 277.274 cubic inches.

Galloway. (1.) Ancient district, in s.w. of Scotland, now comprising the shires of Kirkcudbright and Wigtown. (2.) MULL OF, promontory, Wigtownshire, Scotland; is the s. extremity of the peninsula known as the Rhinns of Galloway. Here are remains of Scandinavian defensive works, and the chapel of St. Medan, in the construction of which a natural cave was used.

Gallowglass, or **GALLOGLASS**, a soldier or retainer kept by Irish chiefs. They fought with hatchets, and were described in 1600 as 'crevell without compassion.' In the Scottish Highlands, an armour-bearer (*galloglach*) who attended the person of his chieftain night and day. In *Macbeth* Shakespeare refers to 'kernes and galloglasses.'



Oak Gall.

Galls are abnormally altered and usually hypertrophied plant tissue-bodies, the alteration commonly due to the activity either of insects or parasitic fungi. The galls produced by insects are of many kinds. Those which take the form of felted growths of definitely limited extent, as in the lime, horse-chestnut, bramble, and walnut, are known as 'felt galls'; those which take the form of a hollow structure created by the hypertrophy of the tissue round the spot occupied by the insect, that spot itself remaining quiet, are known as 'rattle galls'—examples being afforded by the buckthorn and the alpine rose; and those in which an insect pierces the plant and deposits its eggs in its substance, and not

on the surface, thus causing the tissue to hypertrophy in such a way that the wound occupies the centre of the resulting sphere, are known as 'solid or tuberculous galls'—e.g. oak-apples and the bedeguars of the wild rose.

Gall-stones, **BILIARY CALCULI**, or **CHOLELITHIASIS**, are pathological concretions derived from the bile. They are almost invariably formed in the gall-bladder, although in a few exceptional cases they appear to originate in the liver ducts. They may be single, in which case they often attain a large size, instances being recorded of calculi which measured over five inches in length. On the other hand, they may be small and numerous, many hundreds being sometimes contained in a distended gall-bladder; while in some cases they occur in the form of a gritty sand. On section, a calculus exhibits a nucleus, which generally consists of bile pigment; but the greater portion of the stone is composed of cholesterolin, with small quantities of bile acids, pigment, and various salts. A calculus often displays concentric lamination, the outer layers being the more recent.

Seventy-five per cent. of gall-stones occur in women. Sedentary occupations, especially when associated with over-indulgence in saccharine and starchy food and tight-lacing, contribute to the condition, while pregnancy is also an important factor, ninety per cent. of women with gall-stones having borne children.

Symptoms.—In the majority of cases gall-stones produce no symptoms. When, however, the calculi become impacted in the cystic or in the common bile duct, acute symptoms of biliary colic generally supervene. The onset is usually sudden, and is characterized by agonizing pain in the right hypochondriac region, along with vomiting, as well as rigors, rise of temperature, and, it may be, collapse. The pain radiates towards the shoulder, in marked contrast to that of renal colic, which shoots downwards. When the stone is impacted in the common bile duct for some length of time, jaundice develops. The duration of an attack varies from a few hours to several days, and the relief following the passage of the stone into the duodenum is as sudden as the onset of the pain. Chronic obstruction of the cystic duct by gall-stones usually results in great distension of the gall-bladder. Suppuration, with the formation of abscesses, may supervene, and in some cases perforation has led to fatal peritonitis. As a result of perforation, fistulæ between the bile passages and other viscera may be established.

Treatment.—During an attack of acute biliary colic the patient must be kept under morphine, injected hypodermically, and it is usually advisable to administer a little chloroform or ether until the morphine begins to take effect. Hot fomentations should be applied to the abdomen, and hot baths are also serviceable. The patient should be given laxatives, and large quantities of alkaline waters. Between the attacks exercise should be enjoined, and the diet must be regulated so as to exclude as far as possible starchy or saccharine foods. Attempted expression of a stone from the bladder by massage is dangerous in the highest degree, since it may cause perforation. When the gall-bladder is palpably distended, an aspirator may be employed to ascertain the presence and situation of calculi, or to draw off fluid. In some cases, opening the gall-bladder, removing it, or an operation on the ducts, may be advisable.

GALLUS, **CAIUS CORNELIUS** (69 or 66-26 B.C.), Roman poet and statesman under Augustus. At Actium, in 31 B.C., he commanded a detachment in the army of Octavian, and afterwards gained successes over Antony's forces off the African coast, and captured Cleopatra. After her death Gallus ruled Egypt for some years, but incurred the hostility of Augustus, and was exiled by the senate, whereon he committed suicide. He was the friend of Virgil and Ovid.

GALLUS, **CAIUS VIBIUS TREBONIANUS**, Roman emperor (251-253 or 254 A.D.), is said to have contributed by his treachery to the defeat in which the Emperors Decius and Herennius fell. He was then made emperor by the soldiers in November 251, and concluded a disgraceful peace with the Goths. Gallus and his son were slain by their own troops.

Galluzzo, tn., Italy, 3 m. s.w. of Florence, of which it is virtually a suburb. Pop. (1901) 18,859.

Gally, **MERRITT** (1838), American inventor, born near Rochester, New York. He invented a 'universal' printing press, a machine for constructing linotypes, telegraphic, philosophical, and musical instruments, especially the orchestrone, the 'back vent' system for tubular church organs, the counterpoise pneumatic system of the æolian, pianola, and symphony mechanical contrivances in music, the 'differential telephone,' a machine for the construction of types from cold metal by swaging, and the composite swage-locked type-bar or lino-type.

Galop (Fr.), a spirited dance, probably of German origin, in two-four time; also the music

for the same. It became fashionable in Parisian society about 1830, and thence passed into England.

Galphimia, a genus of tropical American evergreen shrubs, occasionally grown in stovehouses for their handsome foliage and racemes of yellow flowers. They all like a peaty soil.

Galston, par. and tn., Ayrshire, Scotland, 5 m. E. by S. of Kilmarnock; has coal-mining, weaving, and lace-making. Pop. of par. (1901) 6,979.

Galt, tn., Waterloo co., Ontario, Canada, 23 m. N.W. of Hamilton; manufactures flour, paper, and machinery. Pop. (1901) 7,866.

Galt, SIR ALEXANDER TILLOCH (1817-93), Canadian statesman, born in Chelsea, the son of John Galt the novelist. Emigrating to Canada in 1835, Alexander Galt was the first finance minister of the Dominion (1867), and its high commissioner to England (1880-3). He also served on many commissions, notably the Halifax Fisheries (1877) and the Washington Treaty (1870). Galt had some part in shaping Canadian fiscal policy.

Galt, JOHN (1779-1839), Scottish novelist, born at Irvine, Ayrshire, and settled in London (1806). His first really successful work, *The Ayrshire Legatees*, appeared in 1820. This was followed in 1821 by his masterpiece, *The Annals of the Parish*. In 1833 appeared his *Autobiography*, and in 1834 his *Literary Life and Miscellanies*. His best novels, besides those mentioned above, are *The Entail* (1824), *The Provost* (1822), *Sir Andrew Wyllie* (1822), and *Lawrie Todd* (1830). Galt's work is very unequal, parts of it being remarkable, and parts of it quite the reverse. In depicting the life of small Scottish towns and villages he is unsurpassed, even by Scott. An edition of his *Novels* appeared in 8 vols. (1895-6). See *Memoir* prefixed to *The Annals of the Parish* (1821).

Galtee, or **GALTY**, a mt. range in Tipperary, Limerick, and Cork counties, Munster, Ireland. The highest summit is Galteemore (3,015 ft.).

Galton, SIR DOUGLAS STRUTT (1822-99), English scientist, born near Birmingham; was appointed secretary to the Railway Commission (1847). After serving in various public employments, such as the directorship of public works (1869-75), he devoted himself to sanitary science and electrical engineering, upon which he wrote extensively. Galton was president of the British Association (1895).

Galton, FRANCIS (1822), English anthropologist and traveller, was born at Duddleston in Warwick-

shire. In 1846 he travelled to the White Nile, and from 1850 to 1852 explored Damaraland and S. Ovampoland, S. Africa. He was secretary of the British Association (1863-8). His *Hereditary Genius* (1869) deeply interested the scientific world, and was followed by numerous works on anthropometrical subjects. From 1885-8 he was president of the Anthropological Institute, of which the Huxley medal was conferred upon him in 1901. In 1902 he was given the Darwin medal of the Royal Society. His principal works are *Tropical South Africa* (1853); *Meteorographica* (1863); *Hereditary Genius*; *English Men of Science, their Nature and Nurture* (1874); *Human Faculty* (1883); *Natural Inheritance* (1889); *Finger Prints* (1893); *Finger-print Directory* (1895); and *Sociological Papers* (with others, 1905).

Galtonia, a genus of S. African hardy liliaceous plants, of which the sweet-scented, white-flowered *G. candicans* is most familiar in gardens. This bears its drooping flowers in a long raceme at the summit of a scape over four feet in height. Galtonias grow best in a light soil containing leaf-mould and peat.

Galvani, LUIGI (1737-98), Italian physiologist and anatomist, after whom galvanism is named, was born at Bologna, and became professor of medicine there in 1762, lecturer in anatomy in 1765, and in obstetrics in 1782. After long study of the effect of electricity upon the nervous and muscular systems of frogs, he published in 1791 his *De Viribus Electricitatis in Motu Musculari*. He made various experiments in this subject, in the course of which he invented a metallic arc, composed of two metals, which, when placed in contact with the nerve and muscle of a frog respectively, caused the latter to contract, probably by the passage of electricity from the nerve. Refusing at the revolution to take the oath of allegiance to the Cisalpine republic, Galvani was deprived of his professorship, but was reinstated shortly before his death. His collected works appeared at Bologna in 1842.

Galvanic Batteries. See **CELL, VOLTAIC.**

Galvanizing, as applied to iron, is the process of coating iron with zinc to protect it from rust—zinc being electro-positive to iron, and corroding before the latter is affected. The iron is very perfectly cleaned, by pickling with acid and scouring with sand, and is then dipped into a bath of molten zinc covered with ammonium chloride to act as a flux. For special purposes the zinc is sometimes also depos-

ited electrolytically. Galvanizing came into general use shortly before 1840.

Galvanometers are instruments constructed for the purpose of detecting the existence of electric currents, or of measuring their strength. For the first purpose a coil consisting of several turns of well-insulated copper wire, with a small magnet sus-

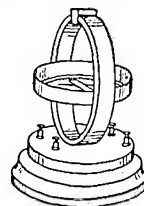


FIG. 1.—Tangent Galvanometer.

pended at its centre, and provided with a pointer, is quite sufficient. This is adjusted so that the axis of the magnet lies in the centre of the plane of the coil, and whenever a current passes round the coil the magnet is deflected from its original position. For measuring the strength of the current there are two possible arrangements of the coil and magnet: (1) The coil is fixed and the magnet movable; (2) the coil is movable and the magnet fixed.

(1.) *Galvanometers with Coil Fixed and Magnet Movable.*—The tangent galvanometer consists of a vertical coil. At its centre is a graduated disc, over which is suspended a small magnet carrying a pointer. The disc with the needle is sometimes made movable, so that it can be placed at various distances from the centre of the coil. In practice the galvanometer is usually adjusted so that the axis of the magnet lies in the plane of the

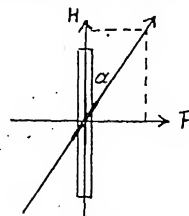


FIG. 2.

coil and at its centre. When this is the case, the pointer should be at zero. The magnet is only acted on by the horizontal component of the earth's magnetic field, and consequently its axis lies in the magnetic meridian. If, now, a current be passed round the coil, a new magnetic field is produced, with its direction at right angles to that of the earth's field. As a consequence the

magnet is deflected, and comes to rest when the moment of the turning couple due to the earth equals that due to the coil. (Fig. 2.)

Let c = current strength; N = number of turns in the coil; r = radius of coil; F = force due to

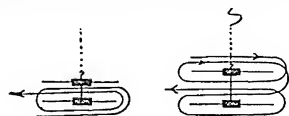


FIG. 3.—Astatic Coils.

magnetic field of coil; H = horizontal component of earth's magnetism; α = angle of deflection.

$$\frac{F}{H} = \tan \alpha. \therefore F = H \tan \alpha.$$

$$\therefore C = \frac{Hr}{2\pi N} \tan \alpha = K \tan \alpha.$$

Hence, by passing a known current through the instrument and noting α , the constant K may be determined. Thus, the comparative strengths of currents passing through a given galvanometer are to each other as the tangents of the respective angles of deflection. It is for this reason that the instrument is called a tangent galvanometer.

In the sine galvanometer the arrangement of parts is similar to that of the tangent galvanometer, but in addition the coils can be rotated round a vertical axis, and the amount of rotation is shown on a graduated horizontal circle. It is now little used.

Astatic galvanometer. When two equally strong magnets are suspended as shown in the sketch, they are not affected by the earth's magnetic field. (Fig. 3.) The combination is said to be astatic, or an astatic couple, and is more sensitive than the single magnet, for the restoring force of the earth's magnetic field is eliminated. The accompanying figure shows a simple form of galvanometer constructed on this principle. It is now seldom used.

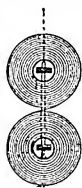


FIG. 4.—Arrangement of Magnets and Coils.

Thomson's reflecting galvanometer. This is an improved form of the astatic galvanometer. The magnets are very small, being small pieces of watchspring, and the coils are wound with only a small centre, so as to be as close as possible to the magnets. In-

stead of a mechanical pointer, a beam of light is used. Light from a lamp is received on a small mirror, on to the back of which the magnets of one coil are fastened, and is reflected on to a scale at some distance. Movement of the mirror causes the reflected beam of light to turn, and the spot of light on the scale indicates with great magnification the movement of the magnets. At the centre of the second coil is a second group of magnets connected by a light rod with the upper ones, and the coils are arranged so that the current turns both sets of magnets in the same direction. The magnet system is hung by a single fibre of unspun silk, which avoids friction of pivots, and exerts only the feeblest restoring force. It is impracticable to keep two magnets truly astatic, and hence the force of the earth's field on the stronger one is reduced by a con-

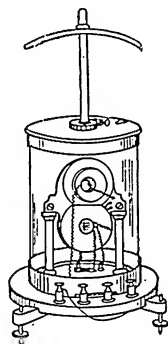


FIG. 5.—Thomson's Reflecting Galvanometer.

ducting magnet, which opposes the earth's magnetic force. By adjusting the distance and position of this control magnet, the sensitiveness of the galvanometer may be made very great, and it forms the most delicate means of detecting an electric current. Fig. 4 shows the magnet system and coils, and Fig. 5 the complete instrument with the controlling magnet on the top.

(2.) **Galvanometer with Coil Movable and Magnet Fixed.**—The D'Arsonval galvanometer is one so constructed. The magnet is U-shaped, and is either set vertically or made up of several piled one above the other horizontally; between the poles are placed the coils, consisting of very fine well-insulated wire wound round a rectangular aluminium frame, and suspended by fine wires attached to the terminals of the instrument. Within the coil is placed a cylinder of soft iron, which concentrates the lines of force so that as many as possible

pass across the coil. To the suspension a mirror is attached, and by its means the deflection is read off. When a current passes round the coil, a magnetic field, whose direction is at right angles to that of the permanent magnet, is pro-

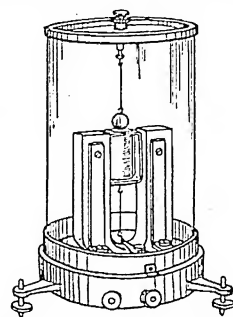


FIG. 6.—D'Arsonval Galvanometer.

duced. Consequently, the coil turns till the moment of the couple due to torsion equals that of the couple due to the coil.

Ballistic galvanometer. Sometimes it is desired to determine the amount of energy produced by the discharge of a condenser, or to compare the capacity of one condenser with another. For this purpose a specially-constructed galvanometer, called a ballistic galvanometer, is used. The magnet is often of a horse-shoe shape, hung vertically, so as to allow of a strong magnet with small radial length. As a slow oscillation is desirable, the magnet is heavier than in the Thomson galvanometer. The coil consists of long fine wire of high resistances wound on ebonite or some similar substance. The instrument is provided with a mirror and

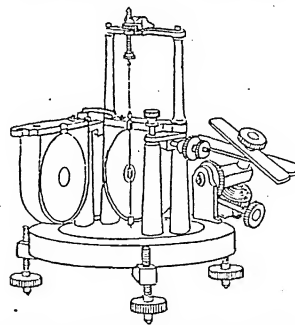


FIG. 7.—Ballistic Galvanometer.

with a controlling magnet. The condenser is discharged through the long coil, and owing to the slowness of oscillation of the magnet, the discharge is completed before the magnet has

appreciably moved. The quantity of electricity passing through the coil is proportional to the sine of half the angle of deflection.

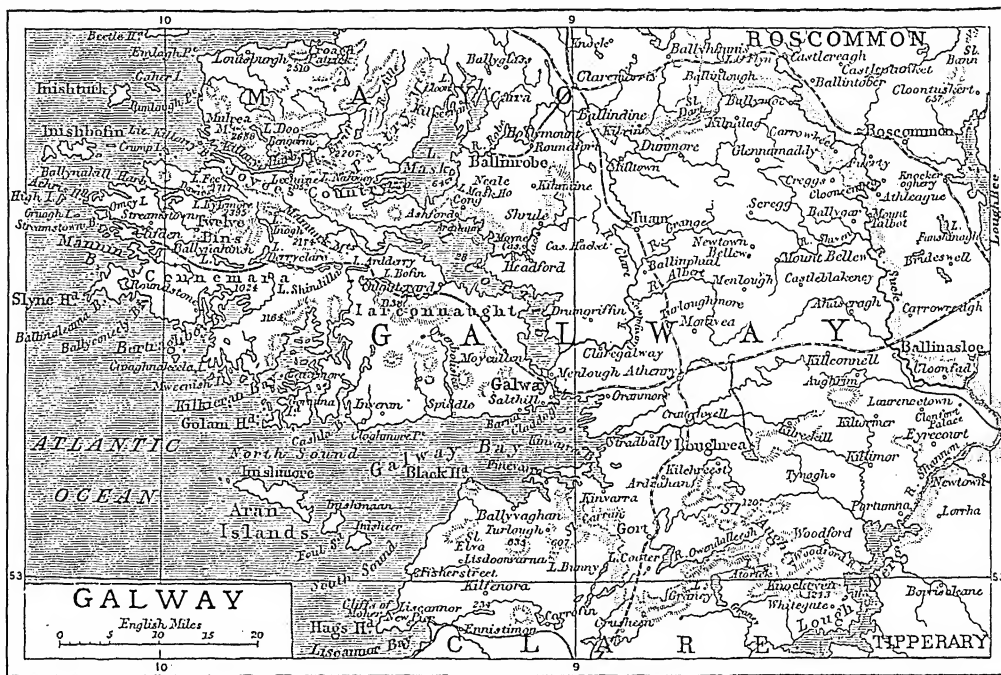
Damping.—For practical work with galvanometers it is often of the greatest importance that the needle or movable coil, instead of oscillating for some considerable time, should come to rest as quickly as possible. The process of reducing the number of oscillations is said to be that of 'damping' them. One of the simplest methods of effecting this is to attach to the suspending apparatus a small vane with its surface at right angles to the direction of motion of the system. The resistance offered by the air

frame have currents induced in them when moving across the lines of force due to the permanent magnet. These induced currents damp the oscillations of the coil, and render it almost dead beat. The needle of the ballistic galvanometer being heavy, would continue to oscillate for a long time. To check this a special damping coil is used. This consists of many turns of insulated copper wire wound inductively upon a bobbin. It is placed close to the galvanometer, and is connected in series with a cell and a tapping key. On depressing the key a current passes through the coil deflecting the needle. By properly timing the depressions

teen years, on condition that the amount be expended in raising the site of the city seven feet, and in building a sea-wall $4\frac{1}{2}$ m. long. Pop. (1900) 37,789. (2.) G. BAY, on the coast of Texas, U.S.A., the harbour of the port of Galveston.

Galvez de Montalvo, LUIS (1549–1610), Spanish poet, born at Guadalajara, principally known by his pastoral poem *Pastor de Filida* (1582), an extremely affected production after the manner of Montemayor. He was a friend of Cervantes.

Galway. (1.) Maritime co. in the W. of Ireland. The coast is broken by deep inlets, bordered with rugged cliffs, and fringed



to the motion of this vane damps the oscillations, and so brings the system quickly to the position of equilibrium. When a small magnet is caused to oscillate above a copper plate, its motion is made slower. This is due to currents which oppose the motion induced in the plate by the moving magnet. In Melloni's instrument a copper plate was used as described above. In Wiedemann's galvanometer the magnet is suspended in a copper box, and through the currents induced in this it returns almost at once to the position of equilibrium. Such a galvanometer is said to be dead beat or aperiodic. In the D'Arsonval instruments the coil and

the needle may be brought to rest in a few moments.

Galveston. (1.) City, Texas, U.S.A., the co. seat of Galveston co., on Galveston Bay. It has a fine harbour, and is the third shipping port of importance in the United States. The principal exports are cotton, hides, and oil from the recently-discovered oil-fields of the state. The value of exports in 1905 was £30,022,508, and that of imports £1,206,700. In September 1900, during a terrific storm, five thousand people are said to have perished, and the value of the property destroyed was estimated at £3,600,000. In 1903 the state of Texas remitted the taxation of the city for seven-

with islands (Inishbofin, Inish-shark, Gorumna, Aran). The surface is mountainous in the w. (Bunnebeola, or Twelve Pins, 2,395 ft.; Mamturk Mts., 2,307 ft.), comparatively level in the E.; in the s. are the Slieve Aughty Mts. The principal rivers are the Shannon, in the s.e., and its tributary the Suck. Loughs Mask and Corrib partly separate the county from Mayo. The w. comprises the wild moorland districts of Joyce's Country, Connemara, and Iarconnaught. Connemara is noted for beautiful marble; limestone abounds. Area, 2,276 sq. m. Pop. (1901) 192,549. (2.) County town, parl. bor., and seapt. of above co., on N. side of Galway

Bay, 115 m. w. of Dublin. The Claddagh is a special quarter inhabited by fishermen. The town has one of the Queen's Colleges. It has an important salmon fishery; exports agricultural produce, wool, and marble. Galway had formerly a great trade with Spain and France. Pop. (1901) 13,414. (3.) G. BAY, a spacious inlet on w. coast of Ireland; length about 30 m., breadth at mouth 20 m. The Aran Isles form a natural breakwater across the entrance of the bay.

Gama, VASCO DA (1469-1524), born at Sines in Alemtejo, Portugal, was the pioneer of European commerce and empire in the Far East. Chosen leader of an expedition to explore the east of Africa, Gama reached Calicut, India, in May 1498. Returning to Portugal in 1499, he in 1502 ventured on a second voyage, and having founded the colonies of Mozambique and Sofala, on the E. coast of Africa, reached Lisbon in 1503. Twenty-one years afterwards he was chosen viceroy of Portuguese India, but died the same year at Cochin. He is immortalized in the *Os Lusíadas* of Camoens. An account of his voyages was written by a companion, Alvaro Velho (*Roteiro da Viagem*, ed. 1838; Eng. trans., *A Journal of the Voyage of Vasco da Gama*, Hakluyt Soc., 1898). See Lord Stanley of Alderley's *The Three Voyages of Vasco da Gama* (Hakluyt Soc., 1869), and Towle's *Vasco da Gama*.

Gamaeliel, the Pharisee who instructed the apostle Paul in the law (Acts 22:3), and whose intervention saved Peter and the other apostles from the summary condemnation of the Sanhedrin (Acts 5:34 f.). He was the grandson of Hillel, the founder of the more liberal Pharisaic school, and was the most distinguished ornament of it, being known as 'the beauty of the law.' He was an enthusiastic student of Greek literature, and manifested a very un-Jewish kindness and courtesy towards the heathen generally. But he does not, as has been supposed, manifest any inclination towards Christianity, and the stories of his conversion and baptism must be dismissed as apocryphal. See Conybeare and Howson's *St. Paul* (1852).

Gambetta, LEON (1838-82), French statesman, was born at Cahors. Having thrust himself to the front in 1868 by his defence of a journalist obnoxious to the dominant party, he was next year returned to the Assembly, as an extreme republican, for both Paris and Marseilles, defeating Carnot in the one case and Thiers in the other. He opposed both the new constitution, which Napoleon got

Olivier to try, and the *plébiscite*; and when the empire fell, he was an important factor in averting a bloody revolution. He was minister of the interior in the first provisional government, and having left besieged Paris in a balloon in October 1870, vested with virtually dictatorial powers, thenceforth directed and managed the war from Tours. But he resigned his powers when his colleagues, in February 1871, entered upon negotiations for peace. Gambetta was elected for nine departments. In a reactionary Assembly he fought resolutely for the republic; but finding that an extreme course tended merely to weaken Thiers and strengthen the monarchists, he invented that 'opportunism' by which all French governments have lived ever since, and started the *République Française* to preach the new doctrine. From 1876 he fought MacMahon and clericalism tooth and nail; and when MacMahon fell, Gambetta was, as the leader of an overwhelming republican majority in both houses, and president of the Chamber of Deputies, the most powerful man in France. His chief ends in politics were the introduction of *scrutin de liste* into the electoral system, and the formation of an international league against Germany. But when, in 1881, he assumed the premiership, he found that constructive statesmanship was not his forte, and his ministry lasted only sixty-six days. He died of an accidental pistol-shot. See Emile Neucastel's *Gambetta, sa Vie, ses Idées Politiques* (1885); Gambetta's *Discours et Plaidoyers Politiques* (1880-4), and his *Dépêches* (1886-92), both edited by Reinach; Von der Goltz's *Gambetta und seine Armeen* (1877); J. Reinach's *L. Gambetta* (1884); and F. T. Marzials's *Life of L. Gambetta* (1890).

Gambia. (1.) British dependency on the w. coast of Africa; extends 250 m. along each bank of the Gambia R., but seldom exceeds an average width of 12 m. Total area, 3,061 sq. m. Pop. (1903) 163,173; of the European settlements, 13,500. The staple export is ground-nuts. Total trade (1904) valued at £617,432. Chief town, Bathurst. In 1904 France was given access to the navigable portion of the river by means of an alteration of the eastern boundary. (2.) River, Senegambia, W. Africa, rising in the Futa-Jallon plateau, flows through the middle of Gambia into the Atlantic at Bathurst, 110 m. S.E. of Cape Verde. It is navigable as far as Barraconda, a town 90 m. from its mouth.

Gambier, or GAMBIR, the Malayan name for an extract from the leaves and small branches

of *Uncaria gambir* and *U. acida*, rubiaceous shrubs growing in the East Indian Archipelago. In common with cutch or catechu, gambier is sometimes called terra japonica. It occurs in brown, porous, earthy-looking cubes and compact masses, is imported chiefly from Singapore, and is used by tanners and dyers, also in medicine as an astringent. The Malays chew it with betel leaf, to relieve affections of the mouth.

Gambier, JAMES, LORD (1756-1833), British admiral, was born in the Bahamas. He was captured by D'Estaing in 1788; was at the relief of Jersey (1779); took part in the capture of Charleston in 1780, and in 1794 in the victory of the 1st of June. In 1807 he commanded the fleet which blockaded and bombarded Copenhagen. Two years later he was in supreme command in the Channel when Lord Cochrane (Dundonald), nominally under his orders, destroyed the French fleet in Basque Road. Gambier failed to act as vigorously as he might have done on that occasion. In 1830 he became admiral of the fleet. He was a lord of the Admiralty (1795-1801). Gambier seems to have been disliked by many of his naval contemporaries. See Chatterton's *Memoirs . . . of Lord Gambier* (1861), and Dundonald's *Autobiography of a Seaman* (1809).

Gambier Islands, a group in the Pacific, 23° 15' S. and 134° 45' W., immediately to the S. of the Low Archipelago. They have been a French protectorate since 1844.

Gambit. See CHESS.

Gambling. At law the following are unlawful games—ace of hearts, basset, dice (except backgammon), hazard, lotteries (except those of art unions), faro (sometimes called pharaoh), roulette (which may be taken to be roulette); and they are generally forbidden in good clubs. Such well-known games as poker, baccarat, trente-et-quarante, euchre, all fours, vingt-et-un, napoleon, and loo may also be considered as gambling games, and are therefore on the *index expurgatorius* of clubs. Gaming establishments, where games of chance can be played with dice, cards, and roulette, are forbidden in England by the Act 8 & 9 Vict. c. 109 (Act to amend the Law relating to Games and Wagers). Another act lays down that the presence of cards, dice, and other instruments of gaming shall be *prima facie* evidence that a house is used as a common gaming-house. No club nowadays could be established on the lines of Crockford's hazard.

In the early decades of the 19th century Paris was the great gam-

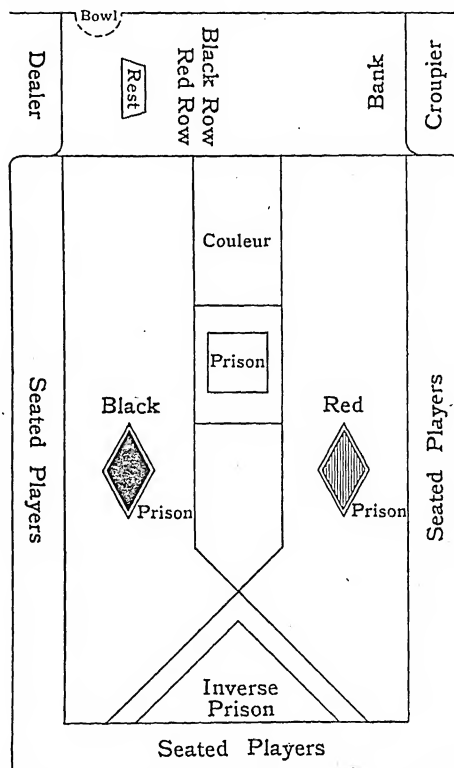
ing centre of the world. Frascati's came to be known in those days as the typical *tripot*. The farmers of the concession were, in turn, Perrin, Bernard, and Bour-sault. From the profits on the tables sums were set aside for the subvention of theatres and the conservatoire of music. In 1825 more than nine million francs were contributed to the treasury by the tables. When the tables were closed (1839) in Paris, Bénazet, who was the farmer at that time, took his cards and his roulette wheels to Baden-Baden. Bismarck wiped all the gambling establishments (Baden-Baden, Wiesbaden, Ems, Homburg, Naueheim, Pymont) off the map of Germany in 1872. Wiesbaden and Homburg both became notorious about the same time that Baden-Baden did. The two brothers Blanc obtained the concession at Homburg, and there the stakes were the highest allowed in any gambling-room of the time, £480 being frequently staked on the turn of a card. But the Blanc brothers had already started business at Monaco and Monte Carlo, on the Mediterranean coast, in 1863. There had, however, been small gambling-houses on the Condamine and in the old town before a company in 1861 conceived the idea of building the present casino. The roulette and trente-et-quarante tables pay for all. Not only do they support the band of the casino, one of the best in Europe, and pay the wages of over a thousand employés, but they have made the principality of Monaco a paradise for its inhabitants. The subjects of the prince, who are not allowed to enter the rooms of the casino except on his birthday, pay no taxes; the public works, road-making, police, schools, churches, charities, are all paid for out of the losses of the players at the tables, and there still remains a sufficiency to afford a large dividend to the shareholders in the company. When the new concession, which holds good until the end of 1947, was signed, the 500-franc shares rose to 4,770. Admission to the gaming-rooms is obtained by cards given by the Controle.

The downfall of the German gambling establishments also made the fortune of Spa, Namur, and other towns of Belgium where public gaming was permitted; and towards the close of the 19th century Ostend became a rival to Monte Carlo. Here the maximums at roulette and trente-et-quarante were the same as at Monte Carlo. No sooner had the new rooms been completed than the two chambers of the Belgian Parliament passed (1902) a law suppressing gambling

throughout the country, and awarding the town of Ostend a few million francs as compensation for the loss of income. This left the field clear to Monte Carlo as the one spot in Europe where roulette and rouge-et-noir are still played publicly.

Baccarat in France is always fenced round by certain club restrictions. Aix-les-Bains, Trouville, and Biarritz are the resorts at which the banks are, as a rule, the highest. The first is in Savoy, and has two casinos, where baccarat is played in the summer and autumn. The second is the great

into the struggle; but the advantages which the bank enjoys were too much for him, and he too vanished. Marvellous instances of inspiration or luck are on record, as when a well-known gambler backed the 8 at roulette for maximums three times in succession, and each time it came up; and on another occasion a royal prince at Monte Carlo, having won 16,000 francs, asked to be allowed to risk it on an even chance, and won. A young American won £20,000 in one day at Monte Carlo; and it is said that Wells, 'the man who broke the



Trente-et-Quarante (diagram of half of table).

Norman seaside town. The third is a little town close to the Spanish border; it possesses two casinos, which are frequented in autumn and spring. A large proportion of its visitors are Russians.

The most famous of 'great' gamblers was Garcia, a Spanish gentleman, who played at Homburg. He had no particular system, but trusted to inspiration, and in the end was ruined. M. Suau de Varenne, another speculator on a large scale, was an accomplished mathematician, and brought a keenly-trained brain

bank at Monte Carlo,' took from the rooms £50,000 in two days. Wells had a system, but it did not save him in the end from a very ignominious failure. Mr. Sam Lewis, the money-lender, was probably the Englishman who at the close of the 19th century won the largest sums against the bank at Monte Carlo.

Of the various systems which have been invented by players, the simplest method is the Martingale, designed to win one unit. A start is made with a louis, or a five-franc piece, or whatever the coin may be in which gambling

is carried on. If a win is made on the first occasion, the original unit is kept to. If a loss is incurred the stake is doubled—thus, 1, 2, 4, 8, 16; and when a win is scored, one unit to the good has been secured, and the player commences again. A more ambitious Martingale than this is one of 1, 3, 7, 15, etc., which, if successful, as it must be with unlimited capital and no restrictions, wins the player one unit for every time he stakes, no matter at what period of the run his win comes. The Paroli is the next most simple method. The system is to play for two wins in succession, leaving the original stake—plus the winnings—on the table for the second coup. A series of losses, of course, necessitates an increase in the stake, and a table is easily constructed giving the number of the attempt, its primary amount, and the profit in case of the double win.

D'Alembert has given his name to a rising and falling system based on the law of equilibrium. He added one to his stake after every loss, and deducted one from his previous stake after every win. He commenced with a stake of one unit. Under favourable circumstances this system works admirably; but mathematicians have proved its fallibility again and again. Wells's system was based on somewhat the same premises as that of D'Alembert. He started with 10 units, decreasing his stake by one if he won, increasing by one if he lost, so that his last stake, if he lost consecutively, was 20. He ceased after winning all ten coups with a gain of 55 units, made up thus: $10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 55$. The weak spot in this system was that, though he won 55 units if a run of 10 occurred at once in his favour, he lost 165 units if a run of 10 occurred at once against him. Other well-known systems are the *tiers-et-tout* (which requires but little capital), the *montant Belge* (which with a large capital gives the player a better chance than most systems do, but which works out very slowly), the Fitzroy, and the Labby. As with sequences, so the intermittences, the changes from head to tail, from red to black, can be made the ground of the system in carrying out which the money is staked.

TRENTE-ET-QUARANTE.—The game of trente-et-quarante is played on a large green table, of which the accompanying diagram shows one half. The game is played with six packs of fifty-two cards, which are carefully counted out on the table by the dealer and then shuffled together. They are out by one of the players, and placed against the rest face down-

wards. The dealer takes some in his right hand, hiding the lowest card by a blank one. He then calls to the players to make their stakes. There are four ordinary even chances on which a player can stake—*viz.* red, black, couleur, and inverse—and the player can also stake his money *à cheval* on any two of these. The simple chances are paid even money. The stakes *à cheval* are paid even money if both chances win, are lost entirely if both chances lose, and the bet is declared 'off' if one chance wins and the other loses. 'Le jeu est fait; rien ne va plus,' cries the croupier; and no further stakes can be placed on the board, for the dealer commences to deal out a row of cards on the table. As soon as the pips on this row of cards (court cards count ten, aces one) amount to thirty-one or over, he stops, announcing the number that has been reached over thirty—thus, 'Un' or 'Deux.' This first row dealt is for the black. He then deals immediately below it, in the same way, a row for the red. Whichever of the two lines shows the nearest total to thirty-one wins for its side, red or black. When the colour of the first card in the first row is the same as the winning side of the table, couleur wins. When the colour of the first card of the first row is the same as the losing side of the table, inverse wins. The dealer never mentions black or inverse in announcing the result. He says, 'Rouge gagne, couleur perd.'

The advantages the bank reserves to itself at trente-et-quarante are these:—It fixes a minimum stake, which at Monte Carlo is one louis. It fixes the maximum which it will pay on any chance; this at Monte Carlo is 12,000 francs. It also retains the *refait* of 31 as giving an advantage. If the dealer shows in both rows an even number of pips of any number except 31, the deal counts as nil. If 31 is the number in both rows, all stakes on the table go into prison, the sums wagered on red and black into the lozenge-shaped spaces on each side of the board, those on inverse into the confined lines of the lower triangle, those on couleur into the square in the centre of the half of the table. Of the stakes placed *à cheval*, a half is mulcted in lieu of imprisonment.

The next deal is commonly called an *après*. The stakes in prison cannot be removed, but may be moved from one prison to another. New stakes may be put on the board. The cards are dealt again in the ordinary manner. The imprisoned stakes on the losing chances are taken by the bank; the imprisoned

stakes on the winning chances are set free, to be left on the board or withdrawn, as the player wishes. If there should be a second *refait* 31, the player has to win twice before coming out of prison. The bank at Monte Carlo allows the player to assure his stake against the *refait* 31 by paying to the bank a premium of 1 per cent. of the sum staked. This premium, which must not be less than five francs and multiples of that sum, renders the *refait* 31 innocuous.

Each trente-et-quarante table at Monte Carlo starts the day with a bank of two hundred thousand francs. When this sum is lost the bank is broken, and play ceases until another two hundred thousand francs are brought from the manager's offices.

ROULETTE.—The game of roulette is played with the aid of a wheel, a table marked on both sides of the wheel, which is in the centre, with numbers and

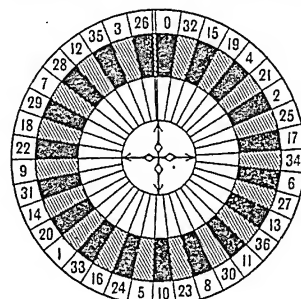


Diagram of Roulette.

other divisions (to be explained subsequently). The wheel is a cylinder, the upper part of which is divided into thirty-seven or thirty-eight sections, each section corresponding to a number marked on the board. The cylinder is balanced on a pivot, and the croupier spins it by means of a metal cross projecting from the centre. The cylinder revolves in a wooden frame, shaped somewhat like a shallow basin, with metal studs in it at intervals. The croupier having spun the wheel (from right to left and left to right alternately), sends by a hand-throw a little ivory ball round the upper part of the basin. After describing an irregular course determined by the studs, it eventually comes to rest in one of the numbered compartments of the wheel, and the croupier calls the number.

At Monte Carlo the wheel has one 'zero' on it and thirty-six numbers, from 1 to 36. At Baden-Baden, at Ems, and at Spa the

roulette wheel had two zeros upon it; and many wheels sold for private play give this advantage to the bank. The above diagram shows the arrangement of the figures on the wheel at Monte Carlo. The arrangement of the board is shown by the accompanying engraving of one-half of a roulette table. The minimum stake at roulette at Monte Carlo is five francs. There are eight methods of staking, shown by the dots on the board.

(1.) *En plein*.—On one number the bank pays thirty-five times the stake. Maximum at Monte Carlo, 9 louis.

(2.) *A cheval*.—On the line between any two numbers. If either of these numbers appears, the bank pays seventeen times the stake. Maximum, 18 louis.

(3.) *La transversale pleine*.—On the boundary line of any row of three numbers. If one of the three numbers appears, the bank pays eleven times the stake. The maximum is 28 louis. A variant of this is to back zero and two of the first row of figures, putting the stake where the two squares touch the zero parallelogram.

(4.) *En carré*.—On four figures. If one appears, the bank pays eight times the stake. Maximum, 38 louis. Zero and three figures can be backed by putting the stake on the junction of the line dividing the zero space from the figures and a boundary line.

(5.) *Transversale simple*.—On six figures. The bank pays five times the stake. Maximum stake, 60 louis.

(6.) On the first, middle, or last dozen, by placing the stake on the little squares marked P M the little squares marked 12 12 or D 12, or on a column by placing the stake in the little space below the column. These are 2 to 1 chances, and the maximum is 150 louis.

(7.) The even chances are wagering on *passe* (19 to 36), *manque* (1 to 18), even (pair), uneven (impair), black, and red. Maximum, 6,000.

(8.) A stake can be placed *à cheval* between two neighbouring even chances. If both chances win, even money is paid. If both lose, the stake is taken by the bank. If one chance loses and one wins, the coup is without result. The minimum stake allowed on this at Monte Carlo is 10 francs.

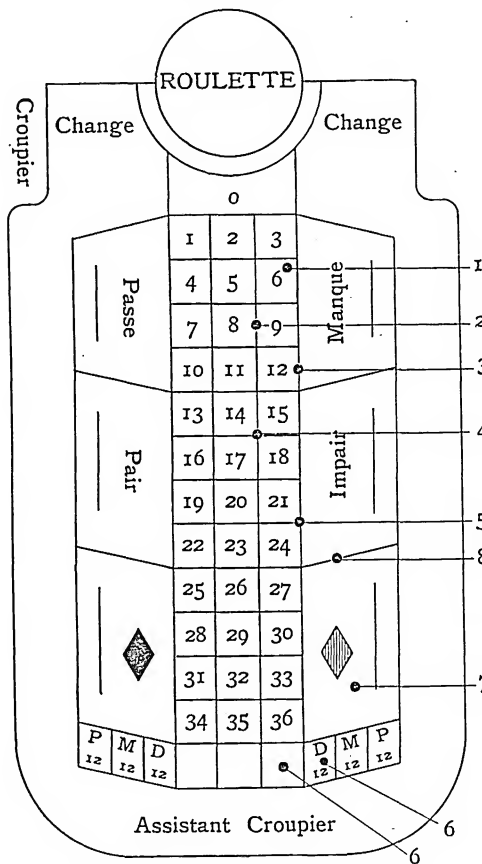
The zero is the great advantage that the bank has over the player. If zero appears, the player who has staked on an even chance has the choice between his stake being relegated to prison until the next throw, or of giving half his stake to the bank. The imprisoned stakes which are on the

winning spaces when the next coup is made are set free; the bank takes the others. Half of stakes *à cheval* on even chances are forfeited if the zero appears.

Systems applicable to trente-et-quarante are also applicable to the even chances of roulette. Combinations, such as a unit on red, one on impair, one on the first dozen, and one on the transversale, 19 to 24, or 22 to 27, are constantly played. Another

backed its number are paid by the bank, which, however, retains as profit a large percentage—generally, if there are six horses paying, only five times the stake.

BACCARAT.—This became the French gambling game *par excellence* during the latter portion of the reign of Louis Philippe, and still retains its pre-eminence in France. There are two forms, *baccarat à banque* (sometimes called *baccarat à deux tableaux*)



Roulette (diagram of half of Table).

favourite method is to watch a croupier, find out the number which seems to come up oftenest when he spins, and back that number and the numbers nearest to it on the wheel.

PETITS CHEVAUX.—This is a very simple form of roulette. A number of little horses are sent spinning round and round a miniature course. On the green table are numbers corresponding to those of the horses. The horse which approaches nearest to the winning post when the horses stop wins. The players who have

and *baccarat chemin de fer*. The latter is rarely played.

Baccarat à Banque.—In general terms, the game of baccarat is played by the man who holds the bank and two sets of players opposed to him. Each set of players wagers that the total of the pips of cards dealt to their representative will come nearer to some sum ending in 9—viz. 9, 19, 29—than those which the banker deals to himself. If these figures are not attainable, those next below (8, 18, 28), and then those next below these again, are

the best to obtain. Court cards count as 10, aces as 1.

Now, as to particulars. The bank is either sold to the highest bidder (the casino taking its percentage from him), or is held in turn by the persons who inscribe their names as willing to risk the minimum sum allowed. The banker takes the centre place at an oblong table; the croupier (who is in clubs and casinos an employé of the management) sits opposite to him. Five players take their seats to the right of the banker, and five to the left. The lookers-on standing behind the players are also allowed, under special regulations, to take a part in the game. The croupier shuffles the two, three, or four packs of cards that are to be used, passes them to the right and to the left, inviting any player who wishes to shuffle them, and hands them to the holder of the bank, who has the right to shuffle last, and who asks a player or a bystander to cut for him. Each player in turn, beginning with the first one to the right, and after him the first one on the left, then makes a stake, generally in counters. (If the total amount staked on the table exceeds the sum in the bank, the banker, or the croupier for him, only pays, if he loses, the sum on the bank, paying the players to the right and left alternately, commencing with those holding the cards.) The stakes having been made, the banker slips the first card off the pack and gives it, face downwards, to the player on his right, the next one to the player on his left, the next one to himself, and deals three more in the same manner and same order. The banker looks at his cards, and if he has 8 or 9 he declares it. If any of the players have 8 or 9 (or 18 or 19), they declare it. If the banker has not 8 or 9, he offers a card first to the right and then to the left, giving the card, if accepted, face upwards. The banker then decides whether he will take a card himself or not. He shows his cards; the players also show theirs. If both players have won, the banker pays all the sums wagered on both sides of the table. Both sides may lose, or one may win and one lose. The player who holds the cards on each side acts for the players on his side of the table. Very little latitude is allowed him; for if the number of pips on his two cards count below 5, he must take a card; if above 5, he must refuse. (He may draw or refuse if he has 5.) Any breach of this rule makes the player who holds the cards responsible for the losses of his side of the table. There are various other penalties which can

be enforced against the players and against the banker, if they make mistakes.

A player holds the cards until his side of the table loses, after which they are dealt to his neighbour in the usual succession. The banker's deal continues until he has lost his money, or until the pack is dealt through. (There must remain ten cards before he makes his last deal.) Any player may challenge the bank for its entire amount at one coup, staking either on one or both sides of the table, and if he loses, may again challenge. This is known as 'going banco.'

Baccarat Chemin de Fer.—In this variation of the game each player in succession to the left of the first dealer takes the bank. Six packs of cards are generally used. The banker (the right to hold the bank first being settled by lot) puts what sum he chooses in the bank, and deals only to the next player on his right, who plays for the table, should no one have claimed the right to go banco. When the banker loses a coup, the deal passes. The banker may pass his deal when winning, giving the player on his right the first choice of taking it; but this does not affect the rotation to the left when the deal is at an end by a coup being lost. The general rules of baccarat apply to *chemin de fer*. There is no game at which so much cheating is practised, and so much dishonest cleverness displayed, as at baccarat.

VINGT-ET-UN.—This game is somewhat similar to baccarat, but every player holds a hand and plays for himself alone. One of the players takes a bank, and is prepared to wager that the two cards he deals himself will come nearer 21 in face value of pips than the cards he deals to any other player. Court cards count as 10, aces as 11 or 1. A 'natural,' the best hand to hold, is composed of an ace and a card counting as a 10. The banker deals two cards, in two rounds, to the players and himself. If he has not a natural, he offers a card to each player, having a right himself to draw a card. If he or a player draws and makes a total of more than 21, the player or the banker loses his stake. The banker, not having a natural and not having overdrawn, pays the players whose total of pips is greater than his, and the other players pay him. In case of equality the banker has the advantage. A natural is very generally paid double, but this and the formation of a pool to go to the first natural are matters to be agreed upon before commencing the game.

POKER.—Poker, the typical gambling game of America, is supposed to be a direct descendant of the old English game of brag. It is generally played with a pack of fifty-two cards, and by any number of persons from two to seven, five being considered the most suitable number. Each plays against the others, and every card counts for its face value, the ace being highest or lowest according to the wish of the holder. Having settled the limit of the 'blind,' the 'straddle,' the 'ante,' and the 'raise'—terms hereafter to be explained—it is usual, unless the players are accustomed to play together and know exactly the conditions under which they are playing, to write down the 'rank of the hands,' in order that there can be no possible dispute on the subject. These are the hands in order, commencing with the lowest:—

One pair.—Two cards of one kind and three useless cards—for instance, seven of spades, seven of clubs, king of clubs, queen of spades, four of hearts.

Two pairs.—Two of one kind; two of another kind and one useless card.

Threes.—Three of one kind and two useless cards.

Straight.—All five cards in sequence, but of various suits.

Flush.—All five cards of one suit, but not in sequence.

Full hand.—Three of one kind and two of another kind.

Fours.—Four cards of one kind and one useless card.

Straight flush.—Five cards of the same suit in sequence with each other.

A royal flush is the highest possible hand in poker, being a straight flush headed by an ace. A hand in which an ace is the only card of any value is spoken of as 'ace high.' A 'bobtail' flush or straight is four cards of the same suit, or a four sequence of different suits.

The first dealer and the position of players can be settled by lot in any manner. The player on the dealer's left is spoken of as the 'age,' the player on the dealer's right as the 'pone' (poney). The dealer shuffles the cards (which may previously have been shuffled by any of the players), and the pone cuts them. The age then 'puts up' his 'blind'—i.e. places, before cards have been dealt, a stake, generally the counter of the smallest value, in the pool basin in the centre of the table. The player next to him on the left may 'straddle'—i.e. put in double the amount of the blind; and the player next to him is allowed to 'double-straddle'—i.e. put in four times the amount of the blind.

The dealer then gives five cards, in five rounds, to each player, beginning at the left. The players make up their minds whether to 'come in'—i.e. to take a further part in the game; and each, commencing with the player on the left of the age, or the straddler or double-straddler, has to state his intention, paying into the pool, if he is going to play, twice the amount of the blind, or of the straddle or double-straddle, if the blind has been straddled. This is the 'ante.' The age, if he wishes to come in, has to double his blind, or bring his stake up to double the straddle or double-straddle; and so with the straddlers.

The dealer asks each player in turn, commencing with the one on the left of the age, or the straddler or double-straddler, how many cards he will take. The player discards the cards he wishes to replace by putting them face downwards on the table, and takes into his hand the others that are dealt to him. When the round has been completed the betting commences. The first player to the left of the age or straddlers backs his hand for a certain amount, which he puts before him. His neighbour, if he wishes to play, 'sees him' (i.e. puts up an equal amount), and can, if he wishes, 'raise' (i.e. increase his stake), within the prescribed limit. When each player has been given his chance of betting, the players who still wish to continue bring their stakes to the level of the highest stake on the table, or else, abandoning the game, pay their amounts already staked into the pool. The players still remaining in then show their hands, the holder of the highest taking the pool; the players who have remained in and lost pay their stakes into the pool.

Jack Pots is a method of increasing pools, and when only one player has remained in and the pool is empty, there being no stakes to pay into it, a jack pot, when jack pots form part of the game, follows. Every player must 'ante,' but no deal can go further than the first distribution of cards, unless one of the players holds two knaves or better. Sometimes half a dozen deals and antes take place before a player owns to two knaves or better. Sometimes an ascending scale—two queens in the second deal, etc.—is determined on; and there are other variations in jack pots.

The *Joker* is a blank card sometimes introduced into the pack, the holder of which can count it as any card he chooses. *Straight Poker* is poker played without a draw. In *Stud Poker* four out of the five cards given to each player

are dealt face upwards. *Whisky Poker* has the peculiarity of an extra hand, 'the widow,' laid face downwards on the table, which any player, in rotation, has the chance of taking in place of his own.

EUCHRE is a game much played in the mining camps of America and Australia. It is played with thirty-two cards, all below the 7 being discarded. For a full description of the game, see the article *EUCHRE*. *Auction euchre* and *railroad euchre* are variations of the game.

NAPOLEON.—Napoleon, more usually called 'nap,' is played with a full pack of cards, by any number of players from two to six. The cards being shuffled and out, the dealer, to whom the lot has fallen, deals to each player five cards face downwards, generally two in one round and three in another. Beginning on the dealer's left, each player in turn bids for the privilege of settling the trump suit, naming the number of tricks he proposes to win playing single-handed against the other players. If he proposes to win all five tricks, he says, 'I go nap.' If a player does not wish to determine the trump suit, he says, 'I pass.' The player bidding the highest number has the first lead, and the first card he plays establishes the trump suit. Players must follow suit if possible. All the other players combine to defeat the highest bidder. The winner of a trick leads in the next round. If the highest bidder wins his specified number of tricks, he is paid a counter for each trick of his bid by every other player. If he fails to make them, he pays the specified number to each of his opponents.

There are many variations of the game. Sometimes it is played with a pool. Sometimes it is permissible to outbid nap, players being allowed, on running an extra risk, to go Wellington or Blücher.

SPOIL FIVE.—This is an old Irish game resembling nap in some respects. The cards count differently, however—the card with the greatest number of pips counting highest after the court cards in the red suits, the card with the lowest number in the black suits. Five cards are dealt to each player. If any one can win three tricks, he takes the pool. If he can win all five tricks, he not only takes the pool, but is paid an additional sum by all the players.

FARO.—This, after euchre, is the chief gambling game of the mining camps. It is played with a box, open at the top, which holds a pack of cards, and a green baize board on which a

complete suit of spades is enamelled. Two cards are pushed out of the box at each deal, called a turn, one being the 'winner,' the other the 'loser.' The betting at faro is as elaborate as at roulette.

LOO.—At one time loo was as popular a game in England as nap, but of late years it has been in little favour. There are several varieties of the game, but the usual ones played are *limited loo* and *unlimited loo*. In the limited game a player is 'looted' for a fixed amount, in the unlimited for the amount which happens to be in the pool at the time. The first round at loo is what is known as a 'simple pool.' The dealer deals three cards to each player, the eldest hand leads any card he likes, and the others follow suit if possible. When any player fails to follow suit, the top card of the remaining portion of the pack is turned, and settles the suit of trumps. The players who fail to make a trick are looted. In subsequent deals, an extra hand, 'the widow' or 'miss,' is dealt, and the trump card turned before play commences. Each player in turn is given the option of playing with the cards already dealt him, in which case he says, 'I stand,' or of taking the 'miss' or 'widow,' or of refusing to play.

OTHER GAMES.—There are many other gambling games which have in their time been popular, but which are now little played—all *fours*, for instance, and its numerous variations; *blind hockey*; *cassino*; and the many dice games. No article on gambling would be complete, however, without mentioning the Chinese game of *fan tan*, which is, in America and in the Far East, notably in the Portuguese colony of Macão, a great gambling game. It is played with a bowlful of cash or beans or buttons, which are counted out in fours, the players betting against the bank as to the number remaining when the last set has to be counted. See *Chance and Luck*, by R. A. Proctor (1887); *Foster's Hoyle* (1897); *Florence's Handbook of Poker* (1896); *Traité Théorique et Pratique du Baccarat*, by Laun (1892); *Ten Days at Monte Carlo at the Bank's Expense*, by V. B. (1898); *Monte Carlo Anecdotes and Systems of Play*, by the same author (1901); and Sir Hiram Maxim's *Monte Carlo, Facts and Fallacies* (1902).

By King's Regulations gambling in any shape or form is strictly forbidden in any garrison, camp, or cantonment of the British army, and is severely dealt with when detected.

For legal aspect of gambling, see *GAMING*.

Gamboge is a gum resin obtained from the East Indian tree *Garcinia cambogia*. It is used in medicine as a hydragogue cathartic and diuretic, the dose being from one to four grains. It is usually dispensed in the form of a compound pill.

Game Laws. Wild birds and beasts good for food and killed for sport are popularly called game. A fox or an otter is not game, because its flesh is not good for food; but the expression 'big game' includes animals which cannot be eaten, such as the lion and the tiger. The animals mentioned in the acts now in force are: deer (but only for the purpose of licences to kill them, and in the Game (Scotland) Act, 1832), hares, pheasants, partridges, grouse, ptarmigan, heath or moor game, black-game, bustards, woodcock, snipe, quails, landrails, and wild ducks.

(1.) Wild animals are not the subject of property until killed and taken possession of, and therefore by the common law a stranger who comes on the land of another, and kills game and carries it off, is not guilty of theft or any other crime, but has only committed a trespass, for which by a civil action he may be made liable for damages. But deer-stealing, and poaching, or trespassing in search of game, have been made criminal by statute. In England, deer on enclosed land belong to the owner of the land, and to take them is theft at common law; but special provisions are contained in the Larceny Act, 1861, as to snaring, killing, and wounding deer on enclosed lands or on unenclosed parts of a forest, chase, or purlieu, and for setting engines to take such deer (23 and 24 Vict. c. 90). In Scotland the destruction of deer may be met by interdict, and they are also protected by the Game (Scotland) Act, 1832. Trespass in search of game in the daytime is punishable by a fine of £2, or £5 if the trespass is by five or more persons acting together, or (in Scotland) if the face is disguised. If the trespasser refuses to give his name and address, or gives a false one, or refuses to quit the land, or returns to it, he may be arrested, and is liable to an additional fine of £5. In England, if there are five or more trespassers, one having a gun, and if by violence or menace they prevent any authorized person from approaching, each of them is liable to an additional fine of £5; and in Scotland there is a similar penalty for assaulting or obstructing any person in the execution of the act (1 & 2 Wm. IV. c. 32; 2 and 3 Wm. IV. c. 68). Trespass in

search of game in the nighttime is a far more serious offence, because apt to lead to affrays, often ending in murder. Night means the interval between the end of the first hour after sunset and the beginning of the last hour before sunrise. Any three or more persons who unlawfully enter or are present upon land at night for the purpose of taking or destroying game or rabbits, any of such persons being armed with a gun or other offensive weapon, are liable on conviction to from three to fourteen years' penal servitude, or imprisonment with hard labour for three years. It is also an offence for any person unlawfully to take or destroy game or rabbits by night on any land, or the outlets of any land to a public way, or on or at the side of a public way, or unlawfully to be or enter upon such land or ways with guns or instruments for taking game. The penalty for a first offence is three months' hard labour; for a second offence, six months and sureties for two years, or twelve months; and for a subsequent offence, three to seven years' penal servitude, or imprisonment for two years. If a poacher assaults or offers violence with an offensive weapon to a person entitled to arrest him, he is liable on conviction to penal servitude for from three to fourteen years, or imprisonment for three years. The Poaching Prevention Act, 1862, applies to the eggs of pheasants, partridges, grouse, and black-game.

(2.) To prevent the extirpation of game a close time is provided—i.e. a period of the year during which it is unlawful to kill a particular species. There is no close time for deer. In Great Britain there is, strictly speaking, no close time for hares, for they may be legally killed at any time; but by the Hares Preservation Act, 1892, it is unlawful to sell any hare or leveret in Great Britain between March 1 and July 31, under a penalty of £1. The act does not apply to foreign hares. Further, by the Ground Game Act, 1880, a person entitled as occupier to kill ground game (hares and rabbits) is restricted from doing so, in the case of moorlands and unenclosed lands (not being arable lands), between December 11 and March 31. In Ireland the close time for hares is from April 30 to August 11 (42 & 43 Vict. c. 23). See CLOSE TIMES.

In the United States, Canada, and some European countries, the first object of the game laws is the protection of the game itself, not the grant of exclusive rights to the owners of properties. The United States laws provide that game, wherever captured,

belongs to the captor, not to the landlord of the ground on which it was captured. The hunter, however, is liable to an action for trespass, or may even be imprisoned. Rights of fishing in the sea or in tidal waters are open to all, but the sole right of the fishing in a river belongs to the owners of the land on its banks. Close times are provided, but these vary in the different states.

(3.) The Ground Game Act, 1880, gives the occupier of land the right to kill hares, which he had not at common law, and makes his common law right to kill rabbits and his statutory right to kill hares inalienable by agreement. The occupier and one other person authorized by him in writing, and who must be either (a) a member of his household resident on the farm, or (b) a person in his ordinary service on the farm, or (c) a person *bond fide* employed for reward for the purpose, may kill ground game with firearms; and the occupier and any number of persons of classes (a) and (b) and one person of class (c), if duly authorized by him in writing, may kill or take ground game in any other legal way. The close time for hares provided by the act in the case of moorland and unenclosed land has been referred to; and the act prohibits every one from killing ground game with firearms by night, or by spring traps (except in rabbit holes), or by poison. The occupier and persons authorized by him under the act do not require a game licence, but when a gun is used a gun licence is required.

(4.) As to licences to kill and deal in game, see LICENSE. See also MUIRBURN, WARREN, and WILD BIRDS' PROTECTION ACTS; and Oke's *Game Laws* (1897), and Irvine's *Game Laws of Scotland*.

Gaming. By the Gaming Acts, 1845 and 1892, all gaming and wagering contracts, and all contracts to pay any person any sum paid by him, or any commission, fee, or reward in respect of such contracts, are null and void, and no action may be brought in respect of them. Thus if A lends money to B, knowing that he is going to bet with it, A cannot recover; and gambling for differences on the Stock Exchange falls under the same rule. Money deposited in the hands of a stakeholder cannot be recovered unless it is to be awarded to the winner of a lawful game or exercise. By the Gaming Acts, 1738, 1739, and 1744, persons who play ace of hearts, pharaoh, basset, hazard, passage, dice (except backgammon), and roulette (otherwise rolypoly), except in royal palaces, are liable to a fine of £50. By

the Gaming Securities Act, 1835, all securities given in respect of a gaming or wagering contract are deemed to be given for an illegal consideration. By the Vagrant Amendment Act, 1873, every person wagering or gaming in a public place (including a railway carriage) with any instrument of gaming is punishable as a rogue and vagabond. (See VAGRANT.) In Scotland the effect of the common law is much the same as that of the statute law in England. Apparently the only English statute which applies to Scotland is the Gaming Securities Act, 1835. Generally the effect of the law both in England and Scotland is that a man cannot be compelled to pay a bet, but can-

which has its source in the Nepal Himalayas, runs S.E., and joins the Ganges near Patna. (2.) LITTLE, also GUNDUCK, riv., India; rises in the Nepal Hills, and joins the Gogra at Sunaria.

Gandamak, vil., Afghanistan, 28 m. W. of Jalalabad; was the scene of the massacre of the British troops from Kabul in 1842. In 1879 a frontier treaty was here concluded with Yakub Khan.

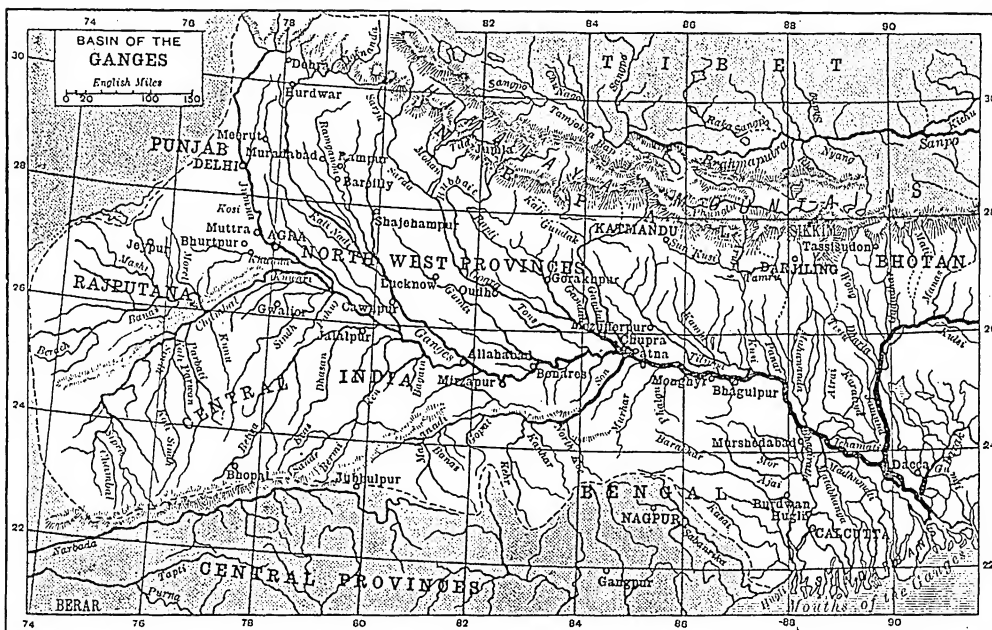
Gandersheim, ancient tn., duchy of Brunswick, Germany, 50 m. by rail S.S.W. of Brunswick. From 856 to 1803 it was the seat of a famous abbey for women of noble birth. Pop. (1900) 3,015.

Gandharvas, semi-divine beings in the mythology of Hin-

Ganelon, in romance, one of Charlemagne's paladins, but a traitor, who, through jealousy of Roland, plotted with the Moorish king the attack on Roncesvalles in which Roland was slain.

Ganesha, or GANA-PATI (i.e. 'Lord of hosts'), the Hindu god, son of Siva, who rules over the demon hosts, especially controlling malignant spirits. He is represented as a very stout man, with the head of an elephant and four arms.

Ganges, the river of India. Its basin, which lies between the Himalayas and the Vindhya Mts., and extends eastward to the mountain barrier between Burma and Bengal, is a rich alluvial plain, remarkable for its



not recover it when it has been paid. See GAMBLING, LOTTERY, BETTING, INSURANCE.

Gammarus, a genus of amphipod Crustacea to which belongs *G. pulex*, a very common freshwater form. See AMPHIPODA.

Gamtoos, or CAMTOOS, river, Cape Colony, rises on the plateau of Great Karoo, flows S.E., and enters the sea at St. Francis Bay, 50 m. W. of Port Elizabeth; length, 200 m.

Gamut, popularly, the musical scale of tones and semitones that makes the octave; by association, the lines and spaces on which the notes are printed.

Gand, Belgium. See GHENT.

Gandak. (1.) GREAT, or GUN-DUCK, known also as the NARAYANI or SALGRAMI, riv. of India,

duism to whom invocations are occasionally addressed in the *Ramáyana*. The term is also applied to a kind of nuptial union, under which captive women were permitted to enter the zenanas of their conquerors without marriage ceremony.

Gandia, city, prov. Valencia, Spain, 35 m. S.S.E. of Valencia; exports oranges, tomatoes, wine, etc. The trade in raisins is now very small (204 tons in 1905). Pop. (1900) 10,026.

Gando, or GANDU, native state in the British colony of N. Nigeria, W. Africa, lying E. and S. of the Sokoto R. and N.E. of the Niger. Area about 80,000 sq. m. The inhabitants belong to the Fulah race. Chief town, Gando, or Gandu.

fertility and density of population. It covers 390,000 sq. m., and its length is 1,557 miles. Rising in a Himalayan ice-cave known as Bhagirathi, in about 31° N. and 79° E., in the state of Garhwal, it descends as a roaring torrent to Gangotri (alt. 10,319 ft.). One hundred and thirty-three miles from its source it receives the Alaknanda, its other important head-stream, and enters British India a little above Hardwar, to which it is navigable for river craft. Thence it flows S.E. past Farukhabad to Cawnpur, the highest point to which loaded barges can ascend. At Allahabad it receives the Jumna, which also has its source in Garhwal, and drains, by means of its main stream and its tribu-

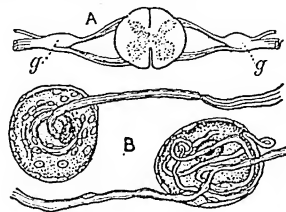
taries (Chambal and Betwa), Rajputana, Sindh, and Bundelkhand. Soon after leaving Allahabad the river turns eastward, and passes Mirzapur, Benares, Ghazipur, Patna, Monghyr, and Bhagalpur, receiving on its left bank the Gunti, the Gogra, and the Gandak, and on its right bank the Son. Some one hundred and forty miles from the sea it unites with the Brahmaputra to form the largest delta in the world. (See **SUNDARBANS**.) The main outlet of the combined streams is the broad estuary of the Megna, while the principal channel of navigation to Calcutta is the Hugli, the westernmost distributary of the delta. A glacier-fed river, the Ganges is replenished by perennial streams, especially in the hot season, when the evaporation of its waters is greatest. Between the rivers Ganges and Jumna (the Doab) is a system of irrigating canals, known as the Ganges Canals, which fertilizes some 2,000 sq. m. The Upper Ganges Canal taps the main stream of the Jumna a little above its confluence with the Betwa; it exceeds 1,000 m. in length, some 400 m. of which are open for navigation. The Lower Canal, begun in 1873, has a main channel of 700 m., and branches not far short of 3,000 m. 'Mother Ganges' is held in peculiar veneration by the Hindus, and every foot of its course from its source to the sea is holy—the confluences of the river with its tributaries, as at Allahabad, being especially so. To bathe in its waters means purification from sin; to die by its stream is blessedness; to be cast into the river after death ensures eternal peace.

Ganges Canal, UPPER and LOWER. See **GANGES**.

Gangi, tn., prov. Palermo, Sicily, 20 m. S.E. of Cefalu. In classical times it was the Enguium, famous for the temple (*Matres Magnae*) which, according to Cicero, was plundered by Verres. Pop. (1901) 11,551.

Ganglion, or **KNOT**. (1.) A collection of nerve-cells on the course of a nerve, forming an obvious swelling. See **NERVOUS SYSTEM**. (2.) The swelling caused by the collection of fluid in the fibrous sheath which surrounds a tendon. It is elastic, slightly movable, and generally painless. It arises from inflammation of the tendon sheath, and occurs most often at the back of the wrist, over one of the extensor tendons of the hand. Sometimes the cyst may be broken by firm pressure or by a smart blow, and the fluid be thus dispersed; or a puncture may be made, with proper antiseptic precautions, and the fluid be pressed out. Sometimes coun-

ter-irritation with iodine causes absorption. In any case, firm pressure with pad and bandage must be used afterwards, to prevent refilling until the cyst walls have united.



Nerve ganglia.

A, Section of spinal cord and spinal nerves—*g g* ganglia; B, nerve cells from spinal ganglia.

Gangotri. See **GANGES**.

Gangpur, native state in Chutia Nagpur, Bengal, India, with an area of 2,484 sq. m. Pop. (1901) 238,896.

Gangrene, or **MORTIFICATION**, is a local death which results in a portion of the body, generally a limb or part of a limb, undergoing putrefaction or mummification, with subsequent separation from the healthy tissues. Gangrene results from the action of bacilli upon tissues whose vitality has previously been lowered. Any interference with nutrition conduces to the onset of gangrene. Constriction of a part, by diminishing the blood supply, may lead to local death. Clinically, two forms of the disease are recognized—dry and moist gangrene. In dry gangrene the dead part shrivels up and assumes a mummified appearance; in moist gangrene, which is more associated with venous obstruction than the other, the parts are soft, putrescent, and malodorous, while in some cases the development of putrefactive gases leads to the formation of bullæ beneath the dead skin. Hospital gangrene was the scourge of surgeons before the era of Lister and the advent of antiseptics.

Treatment.—In many cases the surgeon must content himself with maintaining the patient's strength, checking the advance of the disease, and combating septic infection, until spontaneous separation of the dead part ensues. Sometimes, however, if the gangrene is spreading rapidly, amputation of the necrosed parts is necessary.

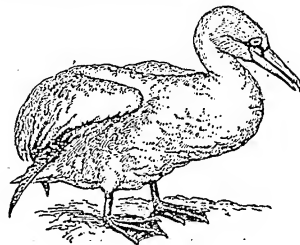
Gangue is the non-metalliferous vein-stuff in which metallic ores occur. It is usually calcite, quartz, barytes, or fluor spar, and is often crushed and separated from the valuable ores by various methods of extraction.

Ganjah, the name given to the dried plants of Indian hemp before the resin has been removed.

It is used chiefly for smoking, and has strong intoxicating and narcotic properties.

Ganjam, tn., Ganjam dist., Madras Presidency, India, 18 m. N.E. of Berhampur, the cap. of the district. Salt is manufactured. Pop. (1901) 4,397. The district has an area of 8,311 sq. m. Pop. (1901) 1,689,142.

Gannet, or **SOLAN GOOSE** (*Sula bassana*), a large marine bird which nests in a few localities in the British Isles—e.g. on Ailsa Craig and the Bass Rock—and is at times abundant off our shores. It belongs to the same sub-order as the cormorant, and may be recognized by the fact that, as in the latter, all four toes are united by a web. The bill is long and strong, and compressed at the point, the face and throat naked, the nostrils obliterated. In adult life the plumage is white, save for the black primaries and a buff patch on the head or neck; but the young are dusky, and do not acquire the white plumage till their sixth year. The nest contains only one egg.



Gannet.

Gannett, HENRY (1846), American geographer, born in Maine; was in 1882 appointed geographer of the United States Geological Survey. His *Boundaries of the United States and of the Several States and Territories* has run through two editions (1885 and 1900), and his *Dictionary of Altitudes in the United States* through three (1884, 1891, and 1899). He has also published *Geographic Dictionaries of Connecticut* (1894), *Massachusetts* (1894), *New Jersey* (1894), *Rhode Island* (1894), a *Statistical Atlas of the United States* (1898), and has written many geographical articles for this encyclopedia.

Gannister, or **GANISTER**, a fine, compact, hard sandstone which occurs in some parts of the Carboniferous rocks of the north of England. It is used for grindstones and for making the hearths of furnaces.

Ganoids, or **GANOIDEI**, the name given to one of the five orders into which many systematists divide fishes. The order includes seven living genera, whose members are all found in

fresh water—viz. *Acipenser* (the sturgeon), *Amia* (the bow-fin), *Lepidosteus* (the gar-pike), *Polyodon* (the spoon-bill), *Polyp-terus*, *Calamoichthys* (the reed-fish), *Scaphirhynchus* (the shovel-beak). The members of these genera are distinguished from their nearest allies, the teleosteans, or bony fish, by the presence of a spiral valve in the intestine, the fact that the tail is frequently heterocercal or unequally lobed, the skeleton often, at least in part, cartilaginous, and the skin furnished with bony scales or scutes (ganoid scales). On paleontological grounds it is now customary to unite ganoids and teleosteans in one order or division, the Teleostomi, and to drop the term ganoid altogether.

Gans, EDUARD (1798-1839), German jurist, born at Berlin of Jewish parentage. He is the principal exponent of the juristic school which sought to found law upon philosophical principles, in opposition to the historical school of Savigny. Gans's views are expounded chiefly in his *Introduction to his Scholien zum Gajus* (1821) and *Das Erbrecht in weltgeschichtlicher Entwicklung* (1824-35). He was professor of law at Berlin University from 1825. His other works include *System des römischen Zivilrechts* (1827), *Vermischte Schriften* (1834), and an edition of Hegel's *Philosophie der Geschichte* (1837).

Gantur, or GUNTUR, tn., Kistna dist., Madras Presidency, India, 50 m. W.N.W. of Masulipatam. Pop. 25,000.

Ganymedes, son of Tros, king of Troy. He was the most beautiful of men, and was carried off by the gods to be the cupbearer of Zeus in Olympus.

Gap (anc. *Vapincum*), tn., dep. Hautes-Alpes, France, 48 m. S.E. of Grenoble; has manufactures of silk, cement, and woollen goods, also distilleries and sawmills. Pop. (1900) 11,018.

Gapan, tn., prov. of Nueva Ecija, Luzon, Philippine Islands. Pop. (1898) 20,216.

Gap Canal, or CANAL DU DRAC, connects the Drac and Durance rivers. Its total length is 445 m.; it was completed in 1888, and is valuable for irrigation.

Gapes. See POULTRY, DISEASES OF.

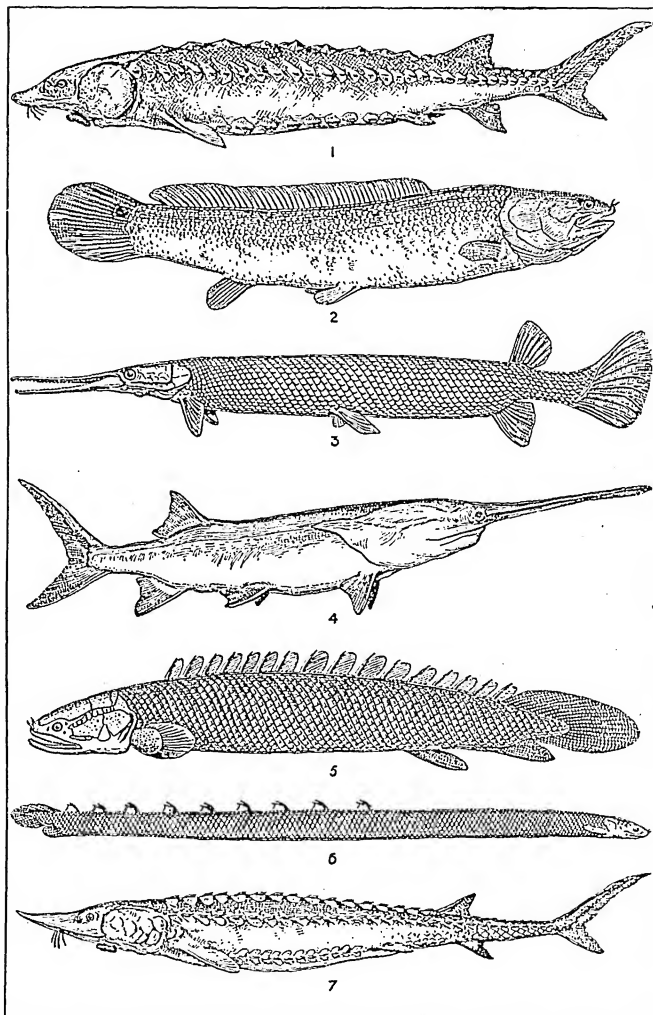
Gapon, FATHER (1839-1906), Russian priest and agitator, born at Poltava; studied for the priesthood, but on account of his strongly radical views, was only admitted under limitations which did not allow of his holding a charge. His energy and force of character, and his untiring zeal and democratic sympathies, secured him a strong hold over the working classes. By the nobles

his power was correspondingly feared. He came prominently before the public as the leader in the strikes in St. Petersburg during the spring of 1905, after which he took refuge in Switzerland. Later he seems to have incurred the suspicion of the revolutionary party, by whom he was assassinated in April 1906.

a total length of 1,852 ft., and a span of 542 ft. It was completed in 1885.

Garag, or GADAG, tn., Dharwar dist., Bombay, India, 42 m. S.E. of Dharwar; has cotton and silk manufactures. Pop. (1901) 30,652.

Garamantes, ancient people of N. Africa, dwelling in Phazania (now Fezzan); their chief



Types of Ganoid Fishes.

1. *Acipenser sturio*. 2. *Amia occidentalis*. 3. *Lepidosteus osseus*. 4. *Polyodon osseus*.
5. *Polypterus bichir*. 6. *Calamoichthys calabaricus*. 7. *Scaphirhynchus platyrhynchus*.

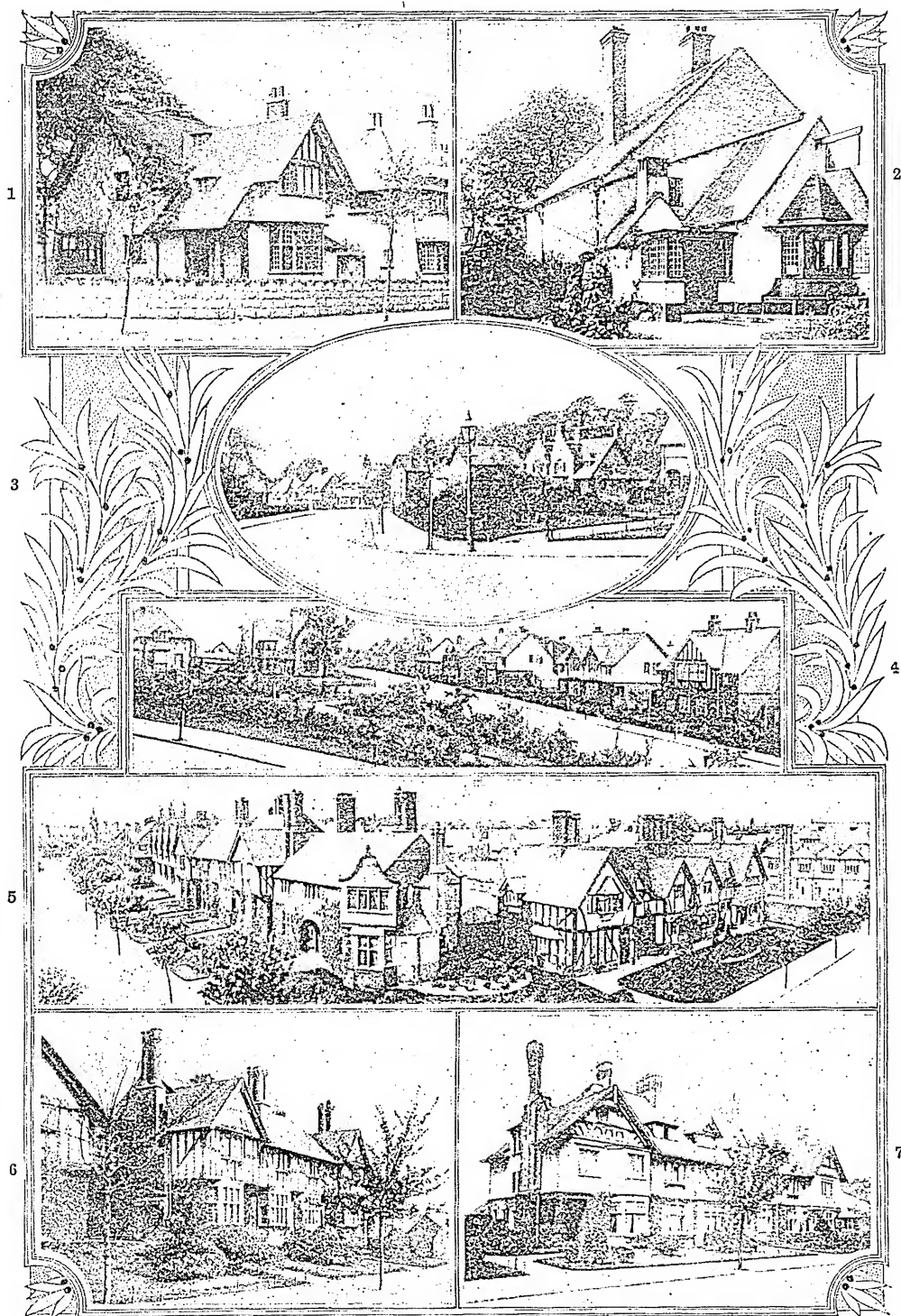
See his 'Life Story' in the *Strand Magazine* (1905).

Gar, a name given to several orders of fishes having long, sharp snouts. See GAR-PIKE.

Garabit, viaduct on the railway from Béziers to Clermont-Ferrand, dep. Cantal, France; was constructed by M. Eiffel. It has

city was Garama. They were conquered by Cornelius Balbus the Younger (B.C. 20).

Garat, PIERRE JEAN (1764-1823), French singer, born at Ustaritz, near Bayonne; was chosen to give singing lessons to Marie Antoinette. After the outbreak of the revolution he re-



Two Pioneer 'Garden Cities.

1, 2, 3, 4. Views in Bournville. 5, 6, 7. Views in Port Sunlight.

moved to Hamburg. In 1796 he was appointed professor of singing at the conservatory of music at Paris. He composed many elegant songs. Sardou has a play (1860) named after him.

Garay, JANOS (1812-53), Hungarian poet, dramatist, and author, was born at Szegszard (Tolna). His epic poem, *Csallár* (1834) was followed by several historical dramas, of which the most famous was *Arbocz* (1837). The romance in verse, *Frangépan Kristófné* (1846), and especially the historical poem, *Szent László* (1850), are widely known. His collected poems were published by F. Ney (1854). See *Life* by Ferenczy (1883).

Garb, in heraldry, a sheaf of wheat. If of any other grain, the kind must be specified.

Garbage, DISPOSAL OF. See REFUSE DESTRUCTORS.

Garborg, ARNE (1851), Norwegian author, born in Jæderen, in S. Norway. Garborg began his career as a literary realist à outrance—e.g. in *En Fritenkjar* (1881); *Bondestudentar* (1883); *Porteljingar og Sogur* (1885); *Mannfolk* (1886); *Hjaa ho Mor* (1890). In his later novels, however, a strong religious feeling prevails. This period is marked by *Trøtte Mand* (1890) and *Fred* (1892), both powerful pieces of analysis, but pessimistic. Garborg has also written an exquisite collection of poems entitled *Haugtussa* (1899 and 1901). Further, he has attempted the drama in *Uforsonlige* (1888) and *Læraren* (1896), and biography in *Jonas Lie* (1893). See his own charming autobiographical *Kolbotnbrev* (1890).

Garcia, MANOEL DEL POPOLO VICENTE (1775-1832), Spanish tenor singer and musical composer, born at Seville. He had great success in Paris in Paer's opera *Griselda*. In Italy, his opera, *Il Califo di Bagdad*, was favourably received, and his singing much admired. At Paris he trained many renowned singers, among them his daughters, Maria (Madame Malibran) and Paulina Viardot-Garcia. — His son, **MANOEL GARCIA** (1805-1906), born at Madrid, lived to be a centenarian, won a brilliant reputation as a teacher of singing, first at the conservatory in Paris (from 1835) and afterwards in London (from 1850), and was the author of *Mémoire sur la Voix Humaine* (1840) and *Traité de l'Art du Chant* (1841; Eng. trans., *Hints on Singing*, 1894). He was also famous as the inventor (1854) of the laryngoscope, indispensable for examination of the throat. He was the brother of Malibran, the *prima donna*, and the teacher of Jenny Lind and Madame Marchesi. On attaining his hundredth year he

was suitably honoured and fêted in London (March 1905).

Garcia III., 'THE TREMBLER' (958-1001), king of Navarre, sometimes confounded with Garcia II. (d. 970), son of Sancho II., began to reign in 994. He helped to defeat Almanzor, general of the caliph of Cordova, at Calatañazor (998). He was the father of Sancho the Great.

Garcia Gutierrez, ANTONIO (1813-84), Spanish dramatist, born at Chiclana, prov. Cadiz. In 1836 he published his first tragedy, *El Trovador*, which was enthusiastically received; this was the literary progenitor of Verdi's better-known opera, *Il Trovatore*. It was followed by *El Encubierto de Valencia* (1840), *El Page, La Campana de Huesca*. Gutierrez was made director of the archaeological museum at Madrid. Among his later dramatic productions are *Simon Bocanegra* (1843); *Juan Lorenzo* (1865), esteemed a masterpiece of modern Spanish drama; and *Venganza Catalana* (1864). Gutierrez also published a collection of lyrical poetry, *Luz y Tinieblas* (2 vols. 1842-61).

Garcia y Miguez, CALIXTO (1836-98), Cuban soldier and patriot. In 1880 he was in rebellion against the Spaniards; was captured and deported to Spain, where he suffered fifteen years' imprisonment. After the outbreak of the last rebellion he escaped (1895) to Paris, whence to the United States, and reached Cuba on the *Bermuda*, with field guns and other military supplies. He won several victories over the Spaniards, and in the Spanish-American war led a Cuban force of 4,000 at El Carey (1898). He died while on a mission to Washington shortly afterwards.

Garcilaso de la Vega. See VEGA.

Garcin de Tassy, JOSEPH HÉLIODORE SAGESSE VERTU (1794-1878), French Orientalist, born at Marseilles. He was a pupil of Silvestre de Sacy. He was the founder of, and later president of, the Asiatic Society. Among his numerous works are *L'Islamisme d'après le Coran* (3rd ed. 1874); *La Poésie Philosophique et Religieuse chez les Persans* (4th ed. 1864); *Histoire de la Littérature Hindoue et Hindoustani* (1839-47); *Rhétorique et Prosodie des Langues de l'Orient Musulman* (1870-1); *Chrestomathie Hindie et Hindoue* (1849); *La Langue et la Littérature Hindoustaniques de 1850 à 1873*, an annual review of the literary movements of modern India.

Garcinia, a genus of tropical evergreen trees belonging to the order Guttiferae. They range between twenty and sixty feet in height, and are not difficult to

grow in a peaty soil in stove-houses. They all bear edible fruit, that of the mangosteen (*G. mangostana*) being especially delicate in flavour. Another species is the gamboge (*G. gambogia* or *G. morella*), so called from its cherry-like fruit.

Gard, dep. of S. France, between the Rhone on the E. and the Cevennes Mts. on the W. The area is 2,270 sq. m., and the pop. (1901) 420,836. The department drains from the Cevennes towards the Rhone by the Ardèche, Cèze, and Gardon, and towards the Mediterranean by the Vidourle and the Hérault. All the rivers are subject to sudden and disastrous floods. The chestnut, mulberry, and olive trees and the vine cover large areas; and the department is very rich in minerals (coal, iron, antimony, silver, lead, etc.). Nîmes is the capital; Alais is the centre of the silk industry.

Garda, LAGO DI, Italy, on the N. edge of the plain of Lombardy, between Venice and Milan. It is 34 m. long by from 3 to 11 m. broad, and 1,136 ft. deep. Area, 180 sq. m. It is the Lacus Benacus of Virgil (*Georg.*, ii. 160). The inspiration of its beauties is perpetuated in the poetry of Virgil, Catullus, Dante, Tennyson, etc. Gardone Riviera is a fashionable resort. See Countess Cesaresco's *Lombard Studies* (1903).

Gardaia. See GHARDAIA.

Gardariki, both in Scandinavian mythology and in later Viking times, the region to the E. of the Baltic Sea, corresponding roughly to the later grand-duchy of Novgorod (the Great).

Gardelegen, anc. tm., Prussian prov. of Saxony, 90 m. by rail W. of Berlin. Pop. (1900) 7,799.

Garden City, vil., Queen's co., New York, U.S.A., 20 m. E. of New York; has a magnificent Episcopal cathedral. The place was founded by the millionaire A. T. Stewart, who laid it out as a model village. Pop. (1900) 750.

Garden City Movement is a result of the success of model industrial villages in country districts, particularly Cadbury's (cocoa manufacturer) at Bournville, near Birmingham, and Lever's (soap-maker) at Port Sunlight, near Birkenhead, about 1890, and later the Rowntree 'garden village' at Earswick, near York. Attention was directed to them by Ebenezer Howard in his book *To-morrow* (1898; new ed., *Garden Cities of To-morrow*, 1902). The Garden City Association was founded in 1899, to establish on similar lines industrial towns for manufacturers generally. A pioneer company having selected a site at Letchworth, near Hitchin, the 'First Garden City Ltd.' was formed in 1903 with a capital of

£300,000 to purchase and develop the estate. In Garden City there will be many open spaces, and a separate garden for each house. Special facilities will be provided in transportation, power, etc. The land will be ultimately transferred to the community or to a trust on its behalf, building sites being let at rents increasing with the city's progress. These rents being expected to provide interest on the price of the estate and all necessary funds for municipal purposes, no rates will be levied. Around the city land will be reserved for agriculture. After the completion of the plan, in the early spring of 1904, the directors began to construct roads, waterworks, and sewerage works, and to let plots of land for factories, residences, etc. A large number of those interested in social reform are taking up land in the new town, either for erecting country cottages with a large garden attached, or for small holdings. In July 1905 a very successful Cheap Cottages Exhibition was held at the Letchworth Garden City. In 1904 the Association des Cités-Jardins de France was founded in Paris for the purpose of establishing similar industrial rural villages to those in England. The active spirit of the French movement is M. Georges Benoit-Lévy, of the Musée Social, Paris. Association's objects: to provide healthy homes for working-men, encourage agriculture, check migration to towns, secure for communities the unearned increment on building land, and cheapen industrial production. See Geddes's *City Development* (1904); Sennett's *Garden Cities in Theory and Practice* (1905).

Gardenia, a genus of tropical trees and shrubs belonging to the order Rubiaceæ. They have evergreen foliage, and bear beautiful white, fragrant, campanuliform flowers. They are largely grown in stovehouses for their flowers, which are much used for cutting. They require a soil containing one-half peat, and like to be provided with abundance of water in summer. They are usually propagated by cuttings taken in January. Gardenias are peculiarly subject to attacks of greenfly and mealy-bug.

Gardening. (1.) **HISTORY.**—Hesiod, Xenophon, and Theophrastus among the Greeks, and Varro, Cato, Pliny, Columella, Virgil, and Horace among the Romans, have left us some account of the horticultural practice of their times. But the monuments of ancient Egypt give plans of irrigated gardens going back sixteen centuries before the Christian era, and the seeds of various cultivated fruits, flowers,

and shrubs have been discovered among the ancient Egyptian tombs. We read, too, of famous hanging—i.e. terraced—gardens at Babylon and Pasargadæ in Persia. Gardening has also been cultivated from time immemorial in India, and above all in China, where many of the people are very expert in this almost universally loved art. It was the Romans who introduced gardening into Britain; they brought many fruits, pot-herbs, and decorative plants. In the 3rd century A.D. the Emperor Probus popularized the cultivation of the vine in these islands. But with the decline of the Roman power, gardening fell into decay, and was only revived by the monks. Medicinal herbs especially were grown in the monastic gardens. Necham's *De Naturis Rerum*, written in the 12th century, gives a list of the plants then grown in the monastic grounds. Later, gardens were formed around the principal castles, including that of the king. Among the plants grown in the time of Henry II. were pears, apples, nuts, cherries, beans, onions, garlic, and numerous medicinal herbs. In the 14th century a complaint was lodged against the gardeners selling their produce near St. Paul's churchyard, in that they blocked the traffic and became a common nuisance on account of their 'scurrlity and clamour.' The practice of gardening soon spread among the poorer people; we read in *Piers Plowman* of them growing beans, apples, pease, onions, and cherries. These, with garlic, leeks, kale, sweet herbs, medicinal herbs, and various fruits, were the chief products of the gardens of the period, which were usually enclosed by high walls or hedges. Periwinkles, marigolds, roses, and violets were among the favourite flowers, the rose most esteemed being a fragrant double red; and the 'Maddonna lily' was held in high honour.

Arbours, fountains, trim hedges, grassy seats, and shady trees gave character to these early gardens. The first garden book written in English was a poem called *The Feate of Gardening*, by Jon Gardener, about the middle of the 15th century. Among the plants named in this book as suitable for a garden are the following: clary, cowslip, foxglove, hawthorn, hollyhock, lavender, mint, parsley, sage, spinage, strawberries, apple, thyme, and rose. In the 15th century flower-gardening became more popular; and about this time the topiary art, which had long before been practised by the Romans, was introduced to Britain. Raised mounds or mounts were also a great feature of the

gardens of that date. These were built up of a great heap of earth, and planted with grass, sweet herbs, or trees, or were elaborately constructed of stone or brick. Arbours and trellis-work were also popular. A little later, the so-called 'knotted' beds, which followed some elaborated geometrical pattern, came into fashion.

In the 17th century pleasure-gardening reached a very high level in England. Parkinson, in his *Paradisi in Sole Paradisum Terrestris* (1629), gives a descriptive list of twelve distinct varieties of fritillaries, eight varieties of grape-hyacinths, twenty-one varieties of primroses and cowslips, and even more of lilies and of roses. In his charming essay *Of Gardens*, Bacon gives a picture of the perfect Elizabethan garden.

Bowling-greens, clipped yews, and sun-dials were all characteristic features of the gardens of this period. Up to the time of Queen Anne formal gardening had held the field unchallenged; but Pope and Addison ridiculed the popular ideal, and soon produced a reaction. The landscape gardener thus came into being; Bridgeman, Kent, Batty Langley, and 'Capability' Brown were the pioneers of the new movement. The gardener tried to 'copy nature'; artificial lakes, streams, ruins, and circuitous drives leading nowhere, were created round every mansion, and stately avenues and terraces were abolished in favour of imitation of nature. But British gardening is now probably at a higher level than it has ever before reached. See Amherst's *History of Gardening in England* (1896).

(2.) **PRACTICE OF.**—In order to grow any considerable variety of flowers, we must screen our garden from cutting winds. Wind-resisting screens may consist either of walls or of suitable hardy trees and shrubs. If the garden is to be enclosed by walls, let these be not less than ten feet; and let them be clothed with a variety of climbing plants, such as the self-clinging *Ampelopsis Veitchii* (Virginia creeper), the blue and the white passion-flower, numerous varieties of clematis, the winter-blooming *Jasminum nudiflorum* (jasmine), wistaria, honeysuckles, *Bignonia radicans*, and many of the roses and vines; while against walls facing north we may grow *Tropæolum speciosum* (scarlet or Scotch *tropæolum*), *Clematis flammula*, the evergreen and Boursault roses, and the Virginia creeper. Among the best of the evergreens for any aspect are the ivies, *Cotoneasters*, and *Crataegus pyracantha*.

For dense hedges perhaps the most useful shrubs are holly, white thorn, privet, barberry, laurel, box, and yew. The ground must be deeply trenched and well manured, so that annual disturbance of the roots may not be required.

No less important than the provision of shelter from biting winds is the preparation or 'making' of the soil. According to the nature of the original rock, and the natural weathering to which it has been subjected, the resultant soil will be mainly sand or mainly clay, or a mixture of the two. Mixed with these there will usually be found a certain quantity of little stones or gravel, and a certain amount of dark-coloured humus. In a soil which is nearly all sand, or in one which is nearly all clay, particular plants may thrive; but in what is called a 'loamy' soil (one in which clay and sand are nearly equal) all plants will prosper, if other conditions be favourable. The presence of humus in the soil is important in many ways; not only does it contain much essential food for plant growth, but it also assists the earth to retain that moisture without which vegetable life is impossible. By its chemical activity, also, it produces heat, and liberates stores of food from the mineral soil itself. Therefore we add dead leaves, farmyard manure, seaweed, and the like to garden soil. But, though moisture is essential to the health of plants, the presence of stagnant water is little less fatal than drought. If a hole dug to the depth of two feet soon shows water not obtained from above, we may assume that drainage is required. If the soil be too light (*i.e.* sandy), it is improved by the addition of dried and powdered clay, meal, and organic manure from cowshed or stable; if it be too heavy (*i.e.* containing an excess of clay), it should be mixed with sand, ashes, lime, gritty road-scrappings, or old mortar.

The roots of plants like coolness in summer, but in winter they need all the warmth that they can obtain; hence the surface of the ground should always be kept open and loose to the depth of an inch or two by means of the hoe. This is of value also in checking evaporation, for the loose and fine surface inch of soil breaks the capillary connection between the air and the deeper layers of soil. Surface mulchings of litter, moss, leaves, or manure act in the same way, besides adding to the soil important food elements. All garden soil should be dug to at least a depth of two feet, and preferably to a depth of three feet.

In the arrangement of a garden two or three important points should be borne in mind. Keep the centre open; frame and mass the sides; avoid scattered effects. Flowers and high-coloured foliage are most effective against a background of green foliage. A flower-bed in the middle of a lawn is only a flower-bed; against the border it is not only a flower-bed, but it may also be a structural part of a picture. Flowers are incidents in a landscape picture. They add emphasis, supply colour, give variety and finish; they are the ornaments, but the lawn and the mass-plantings make the framework. One flower in the border, serving as a true incident of the picture, is more effective than twenty flowers in the centre of the lawn. More depends upon the position which plants occupy with reference to each other and to the structural design of the garden than upon the intrinsic merits of the plants themselves.

The following is a short summary of the principal sowing seasons for vegetables, compiled for Somersetshire, and which needs some modification for more northerly districts:—

In *February* may be sown earliest pease, early horn carrots in warm border, frame radish, spinach, mushrooms, cucumber in heat, melon in heat, early cauliflower in heat, Brussels sprouts in warm border, globe beet in frame, tomato, lettuce, onion, mustard and cress, broad beans, a little broccoli, cabbage, leek in warm border, parsnip in warm border, parsley, celery in heat, early turnip.

March.—Sow early pease, broad beans, Milan turnip, radish, various kales, celery under glass, French beans, a little cabbage, mushrooms, a little broccoli, lettuce, mustard and cress, beet, parsley, early carrot, savoy, leek, Brussels sprouts, onions, melon in heat, cauliflower, herbs, spinach, parsnip, cucumber in heat, tomato in heat, half-hardy annuals in frames.

April.—Sow hardy annuals, pease for second early and main crop, beet, dwarf beans, broad beans, scarlet-runner beans, vegetable marrow in heat, celery, cabbage, Savoy cabbage, cauliflower, leek, lettuce, onion, melon in heat, tomato in heat, mustard and cress, parsley, spinach, cucumber in heat, early whiteturnip, late broccoli, Brussels sprouts, kale, parsnip, radish, early carrot, intermediate carrot.

May.—Sow late pease, Windsor beans, runner beans, dwarf beans, cabbage for late use, Savoy cabbage, cucumber, radish, late broccoli, winter kale, vegetable marrow, Brussels sprouts, spinach,

turnip, beet, horn carrot and main crop carrots, parsley, colewort, onion, lettuce and cauliflower, mustard and cress, parsnip.

June.—Sow early carrot, broccoli, broad beans, mustard and cress, endive, lettuce, onions, radish, spinach, colewort, turnip, melon on hot bed, quick-growing pease, dwarf beans, mushrooms, runner beans, hardy annuals for autumn.

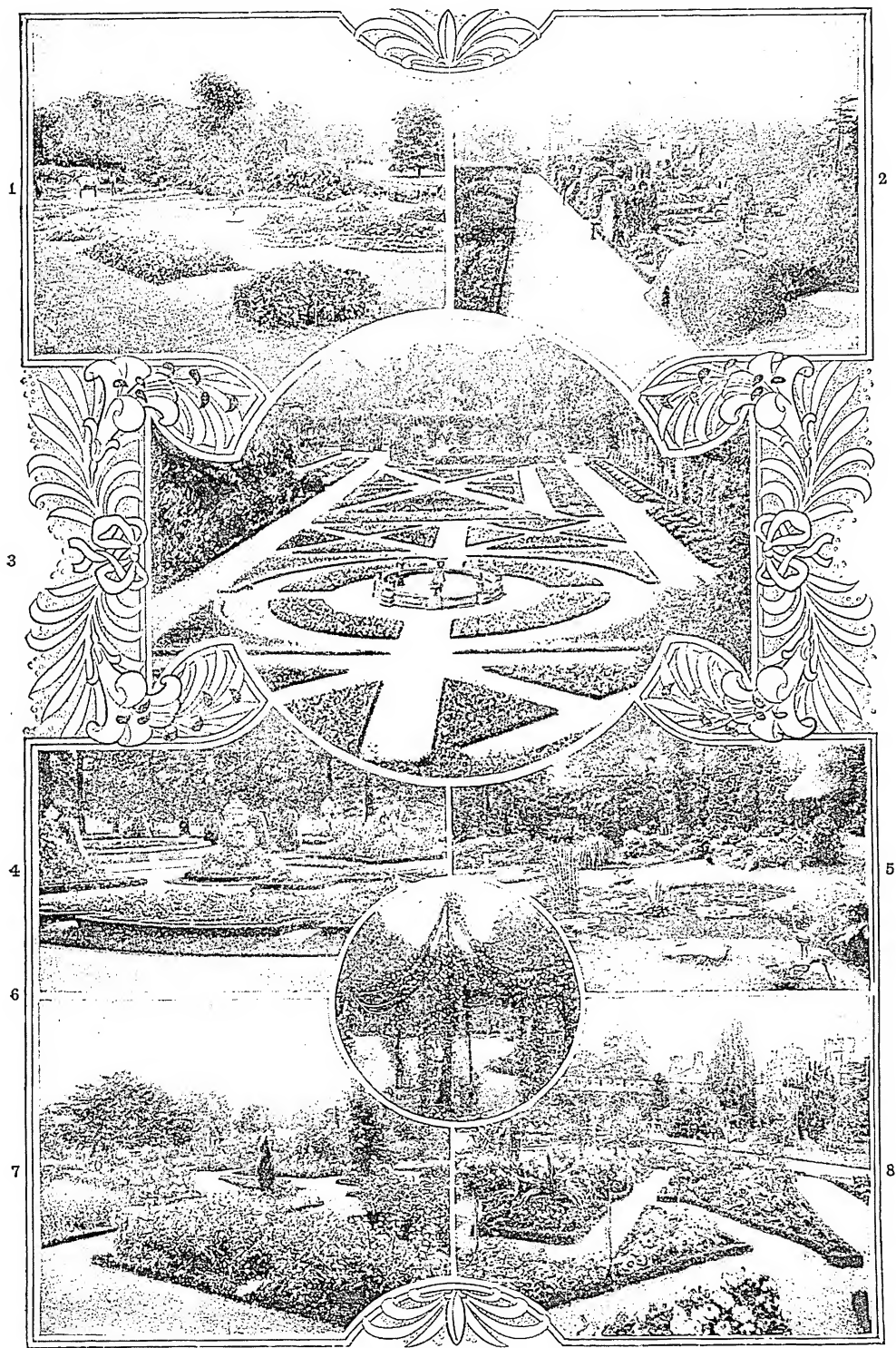
July.—Sow cabbage for spring, colewort, pease (quick-growing kind), carrot, cauliflower, mustard and cress, dwarf beans, lettuce, onion, turnip, endive, tomato, early horn carrot in shade, radish in shade, parsley, prickly spinach, black Spanish radish.

August.—Sow cabbage, red cabbage, colewort, cauliflower, Tripoli onion, lettuce, endive, turnip for winter, horn carrot, mustard and cress, radish, cucumber in heat, melons in heat.

September.—Sow cabbage, horn carrot, mustard and cress, onion, radish, turnip, lettuce, spinach, hardy annuals.

See Nicholson's *Dict. of Gardening* (1885-9); Thompson's *Gardener's Assistant* (1902); Vilmorin's *The Vegetable Garden* (Eng. trans. 1885); Robinson's *The English Flower Garden* (1900); H. Roberts's *Book of Old-fashioned Flowers* (1901); Wythes' *Book of Vegetables* (1901); Quin's *Garden Receipts* (1877).

(3.) MARKET-GARDENING is that branch of agriculture concerned with the production, for market sale, of fruit, vegetables, and flowers. The growth of market-gardening in Great Britain has been one of the most striking phenomena of the close of the 19th century. The steady increase in the cultivation of crops under glass, especially around London, is even more pronounced than the general advance. But so long as the railway charges for the carriage of garden produce remain so high, market-gardening can only flourish near large towns. One very important factor of success is the selection of the most suitable crops to grow. Another point of great importance is to study quality of produce as well as quantity. Flower culture is perhaps the branch of market-gardening from which, under suitable conditions, the greatest financial yield can be obtained from a small amount of land. Here, more than anywhere, quality tells; and the intelligent grower who sacrifices cheapness when planting for the sake of choicer flowers, reaps his due reward. Bunching and packing are matters of the greatest importance. Among flowers usually grown in the open air for market, wallflowers, sweet-peas, early chrysanthemums, and vio-



Some Notable Gardens.

1. Mauldslee Castle, Hamilton. (Photo by C. Reid.) 2. Levens. (Photo by Hogg.) 3. Italian garden, Holland House. (Photo by N. H. King.) 4. Italian garden, Ashridge House. (Photo by J. T. Newman.) 5. Japanese garden, Hinchinbrooke. (Photo by H. N. King.) 6. A rose tent, New Lodge, Berkhamstead. (Photo by J. T. Newman.) 7. Dalsey House, Hamilton. (Photo by C. Reid.) 8. Hinchinbrooke. (Photo by H. N. King.)

lets are perhaps the most profitable; while among the flowers most profitable for glass culture are lilies of the valley, tuberose, roses, arum lilies, madonna lilies, stephanotis, carnations, bouvardias, azalias, and gardenias. Immediately flowers are gathered they should be taken to a cool, not too light shed or underground cellar, and their stems placed in water. Under these conditions they preserve their freshness for a considerable time. Light, heat, and dryness are the chief causes of flowers withering.

Fruit culture affords great room for extension in Britain, and of all hardy fruits apples are the crop of greatest permanent value. Fruit orchards should not be too much exposed to the prevailing wind; if no adequate natural shelter be afforded by the slope of the ground or by trees, hedges and shelter-trees should be planted. For the bulk of the crop, main-crop or keeping varieties should be chosen, as they are much safer in every way, and allow the grower to choose the best time for selling. As a general rule, dwarf trees are the most profitable. They afford a quicker return, are easier to deal with, and are less exposed to wind than are trees of the standard form. For dwarf trees, the broad-leaved paradise stock should be used; but for standards a crab stock is the most desirable. Dwarf apple-trees should be planted 10 ft. apart every way—i.e. 435 trees per acre. Standard trees should have an average space of 27 ft. from tree to tree, or about 60 trees per acre. Mr. Wright names the following as the most profitable varieties of apples. Ecklinville Seedling heads the list, as the trees are heavy bearers and require little

Seedling, with the merit of keeping perfectly sound until the end of May if properly stored. Golden Spire, Worcester Pearmain, Warner's King, Cox's Pomona, Cox's Orange Pippin, King of the Pippins, Lord Suffield, Pott's Seedling, Yorkshire Beauty, Stirling Castle, Tower of Glamis, Maltster, Bramley's Seedling, and Dumelow's Seedling are the other varieties recommended as desirable from a commercial point of view. An average crop from well-grown bush-trees is about 36 lbs. per tree, and an average price is about £16 per ton. Plums are a valuable though somewhat uncertain crop. The best varieties are River's Early Prolific, the Czar, Victoria, Pershore, Pond's Seedling, and Monarch. Pears are, under favourable conditions, a profitable crop, but the conditions of soil and climate are very important to success. Dwarf trees are the most satisfactory, and the following varieties are best worth growing: Clapp's Favourite, Williams's Bon Chrétien, Louise Bonne of Jersey, Pit-maston Duchess, Beurré Hardy, Beurré Chairgeau, Marie Louise, Fertility, and Joséphine de Malines.

For other varieties of fruit, see FRUIT-FARMING.

Of the vegetables most profitably grown on a large scale for market purposes, potatoes, broccoli, cabbages, asparagus, carrots, onions, pease, beans, turnips, and salads may be specially named; though every vegetable may be made to yield profit if conditions and demands are studied. Mr. Whitehead has compiled the following table, showing the average prices for certain English vegetables, with the approximate times of their arrival in market:—

Name of Vegetable.	Date of Arrival at Market.	Price.	Estimated Average Crop per Acre.
Potatoes, New . . .	End of June.	Not quite 1d. per lb.	4 tons 10 cwt.
Asparagus . . .	May.	1s. 3d. to 3s. per 100 heads.	...
Cauliflowers . . .	End of April.	8d. to 1s. 4d. per doz.	...
Scarlet-runners . .	July.	2s. to 3s. per bushel.	300 bushels.
Pease . . .	End of June.	2s. to 3s. 6d. per bushel.	150 "
Lettuces . . .	End of May.	6d. to 1s. per score.	1,400 score.
Radishes . . .	May.	4d. to 8d. per doz. bunches.	1,200 doz. bunches.
Onions . . .	May.	1s. to 2s. 6d. per doz. bunches.	...
Carrots . . .	June.	1s. 6d. to 2s. 9d. per doz. bunches.	400 doz. bunches.
Cucumbers . . .	July.	6d. to 2s. 6d. per doz.	200 barrels.
Cabbages . . .	End of April.	1s. to 2s. 9d. per five doz.	1,000 doz.
Coleworts . . {	Feb., according to season.	9d. to 4s. per doz. bunches.	250 doz. bunches.
Marrow . . .	August.	6d. per doz.	...

pruning. For ten years the lowest price obtained for this variety has been £12 a ton, and the highest has been £22 a ton. He places Lane's Prince Albert second, as it combines nearly all the good qualities of Ecklinville

See also Whitehead's *Vegetable and Fruit Farming* (1890); *Price Essays on Hardy Fruit Growing*, published by the Royal Horticultural Society; and Krapotkin's *Fields, Factories, and Workshops* (1901).

Gardiner, city, Kennebec co., Maine, U.S.A., on the Kennebec R., 47 m. N.E. of Portland. Pop. (1900) 5,501.

Gardiner, JAMES (1688-1745), Scottish soldier, born at Carriden, Linlithgowshire. He fought at Blenheim (1704), and at Ramillies (1706). Ten years later he headed a storming party at the battle of Preston (1715). In 1745, at the battle of Prestonpans, Gardiner met a soldier's death.

Gardiner, SAMUEL RAWSON (1829-1902), English historian, born at Ropley, Hants. He was for some time lecturer on history at King's College, London, but after his election to an All Souls fellowship at Oxford (1884) devoted his whole energies to historical research. His principal work is practically a history of England from the accession of James I. to the end of the protectorate of Oliver Cromwell, but only one chapter of the last volume has been completed. Gardiner was an impartial, painstaking writer, who brought to light much fresh information regarding the period he treated. The chief sections of his *magnum opus* were *History of England from the Accession of James I. to the Outbreak of the Civil War* (10 vols. new ed. 1883-4); *History of the Great Civil War* (4 vols. new ed. 1893); *History of the Commonwealth and Protectorate* (3 vols. new ed. 1894-1903). In addition to these, he published *Prince Charles and the Spanish Marriage* (1869); *Oliver Cromwell* (1901); *What Gunpowder Plot was* (1897); *The Thirty Years' War* (1874); and *Constitutional Documents of the Puritan Revolution* (1889; 2nd ed. 1899). From 1891 to 1901 he edited the *Historical Magazine*.

Gardiner, STEPHEN (?1483-1555), bishop of Winchester, was born at Bury St. Edmunds, and became secretary to Cardinal Wolsey. Sent as ambassador to Pope Clement VII. (1528), he obtained a second commission

on the royal divorce question, thereby winning the favour of Henry VIII. Consecrated bishop of Winchester (1531), and employed on embassies to France and Rome (1531-2), he supported the divorce on national grounds. He did his share in the translation of the New Testament (1535); and Burnet's charge against him of having prevented the new translation (1542) is amply refuted by Dixon (*Hist. of Church of England*, ii. 283-289). Having celebrated mass at Henry's obsequies, Gardiner was ousted from the council and the chancellorship of Cambridge, deprived of his see, and imprisoned throughout Edward VI.'s reign in the Tower. Liberated by Mary and made lord chancellor, he opposed the Spanish marriage, and advocated an English consort for the queen. In the Marian persecutions he practically took no part, declaring strongly against them after the Calais conferences (1555). His endeavours to save the lives of Cranmer and Northumberland are now admitted. Gardiner died in communion with Rome.

Gardner, th., Worcester co., Massachusetts, U.S.A., 70 m. N.W. of Boston; manufactures wooden wares. Pop. (1900) 10,813.

Gardner, ALAN, LORD (1742-1809), English admiral, born at Uttoxeter in Staffordshire, and took part in the capture of the *Courageux* (1761). In command of the *Maidstone*, he captured, after a severe action, the French *Lion* (1778). In 1779, in Byron's action off Grenada, he was in command of the *Sultan*. In 1782, in the *Duke*, he took part in Rodney's victory off Les Saintes. Appointed a lord of the Admiralty in 1790, he was present at Howe's victory of the 1st of June 1794. He next took part in Bridport's action off L'Orient in 1795; and attained the rank of admiral in 1799.

Gardner, ALAN HYDE, LORD (1770-1815), English vice-admiral, eldest son of the first Lord Gardner; was in command of the *Hero* under Calder in the action off Ferrol in 1805. Soon afterwards, in the same year, he took part in Strachan's action off Cape Ortegal. In 1809 he assisted in the Walcheren expedition.

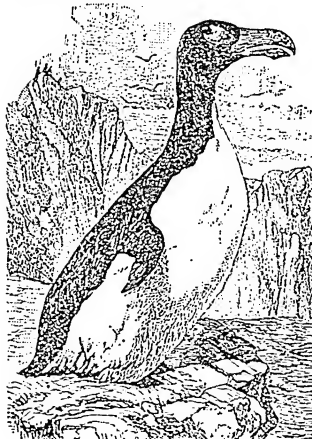
Gardner, ERNEST ARTHUR (1862), Yates professor of archaeology, University College, London; born in London. Mr. Gardner, who was Craven student (1887-9), was first engaged (1885-6) in exploring Naukratis, a Greek settlement in Egypt, of the 7th century B.C. The chapter on inscriptions in *Naukratis I.* (1886), and the memoir *Naukratis II.* (1888), published by the Egypt Exploration Fund,

were written by him. From 1887 to 1895 he was director of the British School of Archaeology at Athens. Since 1897 he has been joint-editor of the *Journal of Hellenic Studies*, and is also author of *A Handbook of Greek Sculpture* (1896-7), *Ancient Athens* (1902), and of articles in the *Encyclopædia Britannica* (10th ed. 1902), and in Smith's *Dictionary of Greek and Roman Antiquities* (3rd ed. 1890), etc.

Gardner, PERCY (1846), English numismatist and archaeologist, born at Hackney, London; was appointed assistant in the British Museum in 1871, and afterwards Disney professor of archaeology at Cambridge (1880-6). Since 1887 he has filled the chair of classical archaeology at Oxford. His numerous publications include *The Parthian Coinage* (1877); *Samos and Samian Coins* (1882); *The Types of Greek Coins* (1883); *New Chapters in Greek History* (1892); *Sculptured Tombs of Hellas* (1896); *Exploratio Evangelica* (1899); *Historic View of the New Testament* (1901); *Oxford at the Cross-Roads* (1903); *Grammar of Greek Art* (1905). He was editor of the *Journal of Hellenic Studies* (1880-96), and joint-editor of the *British Museum Coin Catalogues* (1873-86).

Gardone Riviera, health resort of Italy, on the w. shore of Lago di Garda, 2 m. N.E. of Salò; has come into repute since 1884. Pop. (1901) 1,710.

Gardoquia, a genus of S. American evergreen labiate plants characterized by their long tubular corolla. Gardoquias are easily grown in a light peaty soil in a cool greenhouse.



Gare-fowl, or Great Auk.

Gare-fowl, or GREAT AUK (*Alca impennis*), a flightless member of the bird family of Alcidae, which inhabited the northern

hemisphere, and was exterminated in the 19th century, the last pair having apparently been captured in Europe in 1844. Owing to the shortness of the wings, the birds, although admirable swimmers, were incapable of flight. The most famous breeding-places were three islets off Iceland, and Funk I., near Newfoundland. The gare-fowl reached a length of thirty-two inches, and resembled a flightless razorbill. The bill was as long as the head, and was grooved. The plumage was black above and white beneath, with a very characteristic white spot in front of the eye.

Gare Loch, arm of the Firth of Clyde, Scotland, running N.W. from Helensburgh. It affords good anchorage, and here steamers adjust their compasses. Row, Shandon, Garelochhead, Clynder, and Roseneath (see Scott's *Heart of Midlothian*) are favourite summer resorts. Length, 7 m.; average breadth, 1 m.

Gareloch. See GARLOCH.

Gareth and Lynette. See IDYLLS OF THE KING.

Garfield, JAMES ABRAM (1831-81), president of the United States, born in Ohio. In 1856 he was appointed professor of ancient languages in Hiram College, Ohio, of which he afterwards became president. In the civil war he was promoted to major-general for bravery at Chickamauga (1863). In the following year he took his seat in Congress. In 1880 Garfield was nominated republican candidate for the presidency, to which he was elected in November. But on July 2, 1881, he was shot by a madman named Guiteau, and died on September 19.

Gargantua. See RABELAIS.

Gargoyle, the name in Gothic architecture of a spout projecting from the gutter of a building, in order to carry the rain-water clear of the walls. Gargoyles are usually carved into different forms—animal, human, or grotesque.

Garhwal. (1.) District, United Provinces of Agra and Oudh, India, with an area of 5,623 sq. m. Pop. (1901) 429,900. (2.) Feudatory state in the same provinces, India; adjoins the above district of Garhwal. Area, 4,164 sq. m. It is traversed by lofty mountain ranges. Pop. (1901) 268,885.

Garibaldi, GIUSEPPE (1807-82), Italian patriot and guerilla-leader, born of a Genoese family, at Nice. He early became implicated in Mazzini's movement for Italian liberty, and had in consequence to flee the country (1834). After various adventures he entered the service of the revolted Brazilian state of Rio Grande (1836), and then of the republic of Monte Video (1842-6). In 1848 we find him again in Italy, leading

a body of volunteers against the Austrians. Thence he passed to Rome, then in the hands of the patriots and besieged by the French, and materially assisted in its defence. The breakdown of the popular movement sent him again upon his travels. But in 1854 he settled on a small farm in the island of Caprera (north-east of Sardinia), whence he eagerly watched the issue of Cavour's policy in Italy. After fighting in the Sardinian cause against Austria in 1859, he in 1860 pro-

leaving him absolute master of the island. Between August 9 and 19 Garibaldi crossed to the mainland, and his progress towards the capital (Naples) was a triumphal procession.

Meanwhile Cavour, disliking the republicanism to which Garibaldi was inclined, endeavoured to get possession of Naples before Garibaldi reached it; but Garibaldi was too quick for him, and entered the city on September 7. When, however, the Sardinian army of Victor Em-

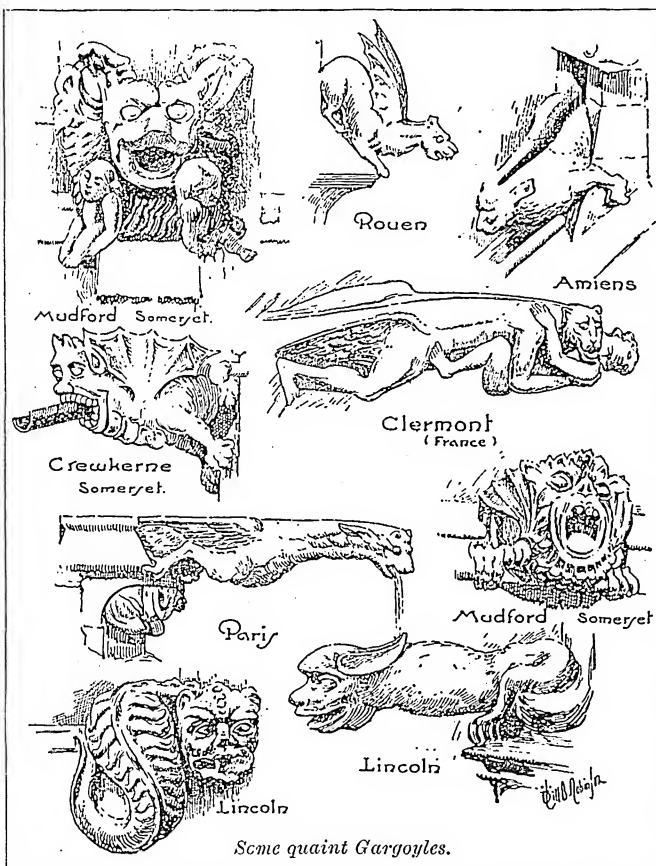
tana, near Rome, and was taken prisoner by the Sardinian government (Nov. 1867), and confined for some days near Spezia, whence he was allowed to retire once more to Caprera. His only other public act was his rather quixotic attempt to aid the infant French republic against the Germans in 1870-1, when he headed a corps of French volunteers in Burgundy. His campaigning was unsuccessful, and he felt bitterly the criticisms to which the French subjected him. See his *Autobiography* (Eng. trans. 1889), J. T. Bent's *Life of Garibaldi* (1881), Mario's *Garibaldi e i suoi Tempi* (1884), Melena's *Garibaldi* (1884).

Gariep. See ORANGE RIVER.

Garigliano (anc. *Liris*), river, S. Italy, rises on the borders of Abruzzi, and flows 104 m. to the Gulf of Gaeta, on the Mediterranean. Near it, in December 1503, the French were defeated by the Spaniards under Gonsalvo de Cordova. Here the Chevalier Bayard made his famous defence of the bridge over the river.

Garlic (*Allium sativum*), a plant of strong flavour. It is an easy crop to grow, either from seeds or from divisions of the cloves of the bulbs. The latter should be planted in light soil, about eight inches apart, after the manner of shallots, and harvested in August. It may then be stored for the winter. Oil of garlic occurs naturally in the common garlic, and is obtained by bruising the bulbs, digesting in water, and distilling in steam. It can also be prepared artificially. It is used in medicine as a stimulant, diuretic, and irritant.

Garnet. The garnets crystallize in the cubic system, usually as rhombic dodecahedra, and have a resinous lustre, a hardness of 7, a specific gravity over 3.5, and a very imperfect cleavage. Their colour is mostly brown or red, but may be black, green, or yellow, and colourless crystals are sometimes found. Their chemical composition varies, and they are an excellent example of an 'isomorphous' group. Garnets are found in igneous, sedimentary, and metamorphic rocks. They are commonest in the crystalline schists, in mica schist and gneiss, and in metamorphic limestone, though good specimens are also obtained from veins. The varieties pyrope (dark red), almandine (bluish red), and uvarovite (green) are semi-precious stones, and are used in jewellery, though they are not of great value. Pyrope, which was known to the ancients as 'carbuncle,' is abundant in some serpentines in Saxony and Bohemia. Almandine is mostly obtained from Ceylon, Burma, and Brazil. Uvarovite is found in the Ural Mts,



tested against the cession of Nice and Savoy, which Napoleon III. had exacted from Cavour. In this same year he sailed from Genoa with the famous 'thousand volunteers,' and on May 11, 1860, landed at Marsala in Sicily, routed at Calatafimi a much larger body of troops sent against him, and within twenty-six days from landing made himself master of Palermo. In a couple of months he was at the head of 18,000 men; and on July 28 the Neapolitans evacuated Messina,

manuel appeared on the Neapolitan frontier. Garibaldi resigned his dictatorship, and on Nov. 9, 1860, retired to Caprera. But the dream of a united Italy, with Rome as its capital, attracted him, and twice he called his volunteers to the task. The first time he was severely wounded in a battle against the royal troops at Aspromonte (1862); but on the second attempt (after a visit to England in April 1864) he met with a severe defeat from the papal and French troops at Men-

Garnett, HENRY (1855-1906), English Jesuit, born at Heanor, Derbyshire. After being in the employment of Tottel, the law printer, as a corrector of the press, for two years, he crossed to Spain, and in September 1875 joined the Society of Jesus, and was sent back to England in 1886 as provincial of the order. On March 28, 1906, he was tried at the Guildhall for supposed complicity in the Gunpowder plot, and being found guilty was sentenced to be hanged and quartered.

Garnett, RICHARD (1835-1906), English writer, was a native of Lichfield. He was appointed assistant librarian in the British Museum in 1851. He became assistant keeper of printed books in 1875, was superintendent of the reading-room from 1875 to 1884, and keeper of printed books from 1890 to 1899, when he retired. He was president of the Library Association (1892-3), and has been president of the Bibliographical Society since 1895. He has been a copious contributor to the *Encyclopædia Britannica* and the *Dictionary of National Biography*. He has edited a large number of works since 1859, including the British Museum Catalogue from 1881 to 1890. His edition of Beckford's *Vathek* (in 1893) solved finally the question of the circumstances of its composition and publication. His principal independent publications have been *Primula* (anon. 1858); *Io in Egypt* (1859); *Idylls and Epigrams* (1869); *Life of Thomas Carlyle* (1887); *Life of Emerson* (1888); *The Twilight of the Gods* (1888; new ed. 1903); *Life of Milton* (1890); *Iphigenia in Delphi* (1890); *Poems* (1893); *The Age of Dryden* (1895); *William Blake* (1895); *Sonnets of Dante, Petrarch, and Camoens* (trans. 1896); *History of Italian Literature* (1898); *Life of E. J. Wakefield* (1898); *Essays of an Ex-Librarian* (1901); *The Queen, and Other Poems* (1901); *De Flagello Myrteo* (1905); with E. Gosse, an illustrated *English Literature* (1903-4); and *William Shakespeare* (1903).

Garnier, JEAN LOUIS CHARLES (1825-98), French architect, born at Paris; travelled in Italy and Greece from 1848-54. His design for the Parisian opera-house was accepted, and he superintended its erection from 1863-74. He also designed the Cercle de la Librairie for the publishing firm of Hachette in Paris, also the casino of Monte Carlo and the observatory of Nice. He published *A Travers les Arts; Causeries et Mélanges* (1869); *Études sur le Théâtre* (1871); *L'Habitation Humaine*, in collaboration with Ammann (1892).

Garnier, JOSEPH CLÉMENT (1813-81), French economist and

free-trader, born at Beuil, near Nice. In 1842 he founded, with Guillaumin, the Société d'Economie Politique (of which he remained secretary till his death), and, with Bastiat, Chevalier, and others, the Association pour la Liberté des Echanges. He was professor of political economy successively at the Upper Commercial School in Paris, the Athénée Royal (1843), and the Ecole des Ponts et Chaussées (1846). Garnier published *Traité d'Economie Politique* (1846; 9th enlarged ed. 1889); *Richard Cobden, les Liqueurs et la Ligue* (1846); *Des Principes de Population* (1857); *Traité des Finances* (1862). He founded (1841) and edited (from 1845) the *Journal des Economistes*. See *Life* by his brother (1882).

Garnier, MARIE JOSEPH FRANÇOIS (1839-73), known as Francis, French naval officer and explorer, born at St. Etienne; sailed to Cochinchina with Admiral Charner; and was commander of the expedition of 1860-2. A member of the expedition through Tibet (1866-8), after penetrating to Tali-fu, the capital of Yün-nan, he successfully reached Shanghai. After serving in the defence of Paris (1870-1) he returned to the East, and met his death after capturing Hanoi, the capital of Tong-king. His chief work, *Voyage d'Exploration en Indo-Chine*, appeared in 1873. See *François Garnier*, by Petit (1885).

Garnier, ROBERT (1534-90), French poet, born at La Ferté-Bernard (Sarthe), held a legal appointment at Le Mans. The merit of his tragedies has won for him the title of forerunner of Corneille. Among them are *Antoniüs* (1578; new Eng. trans. 1897); *Cornelia* (1574; new Eng. trans. 1894); and *Sédécie ou les Juives* (1583), a Biblical tragedy, one of his best. A collected edition appeared at Paris in 1585, and another in 1883. See *Étude sur Robert Garnier*, by Bernage (1880).

Garnierite, a fibrous or amorphous silicate of nickel and magnesium, found in serpentine rocks in New Caledonia and in Oregon, U.S.A.; valuable as a source of nickel. Its colour is a fine apple green or emerald green, and it is always massive, granular, or concretionary, never crystallized. As an ore it is easier to treat than the nickeliferous pyrites which are its chief competitors.

Garnier-Pagès, ÉTIENNE JOSEPH LOUIS (1801-41), French politician, born at Marseilles, where he practised as an advocate before the outbreak of the revolution of 1830. Hurrying to Paris, he took a prominent part in the proceedings of July, and in 1831 became the acknowledged leader of the democratic party in the Chamber.

Garnier-Pagès, LOUIS ANTOINE (1803-78), half-brother of the preceding, also took part in the July revolution, and after his brother's death, in 1841, entered the Chamber and became leader of the extreme Left. Elected mayor of Paris and minister of finance in 1848, he met the financial crisis by successful though unpopular measures. He afterwards served as a member of the Corps Législatif in 1864, and of the provisional government of 1870-71. His chief work was the *Histoire de la Révolution de 1848* (1861-2), besides which he published *Histoire de la Commission Exécutive* (1869-72) and *L'Opposition et l'Empire* (1873).

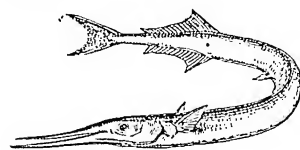
Garnishee. See ATTACHMENT.

Garò (formerly spelt Garrow) Hills, rugged district (highest point, 4,650 ft.) in Eastern Bengal and Assam, India, with an area of 3,270 sq. m. It is covered with sal forests. Coal is found. The aborigines (Garos) are related to the Burmese. Their language has an Aryan admixture, and they retain several interesting customs. Pop. (1901) 138,274.

Garofalo, brush-name of BENVENUTO TISI or TISIO (1481-1559), Italian painter, born at Ferrara; worked for some years at Ferrara; and finally, coming into contact with Raphael at Rome in 1509, accepted him as his master and model. Returning to Ferrara, he worked there until overtaken by blindness in 1559. His pictures show vigour of colouring, but a conventionality in drawing which asserts itself increasingly in his later work.

Garonne, riv. of France, rises E. of Maladetta, the highest peak in the Pyrenees, and flows generally N. to Toulouse through the dep. Haute-Garonne. From Toulouse to the mouth of the Gironde estuary its direction is generally N.N.W., the whole course being 350 m. It receives on the r. bk. the Ariège, the Tarn, the Lot, and the Dordogne.

Garonne, HAUTE. See HAUTE-GARONNE.



Gar-pike.

Gar-pike. (1.) A species of the fish genus *Belone*, which are common in temperate and tropical seas. The jaws are prolonged into a slender beak, by means of which the fish snap up the small prey on which they feed. All the rays of the dorsal and anal fins are united by membrane. In the seas

of N. Europe generally occurs *B. vulgaris*, which grows to a length of about two feet. It is edible, but the bones are green. The garpike belongs to the family Scombræcidae, to which the flying-fish also belongs. (2.) The name is also given to the bony pike, a ganoid fresh-water fish of the genus *Lepidosteus*, found in America. The body has an armour of enamelled scales, is elongated, and terminates in a remarkable beak-like snout furnished with strong teeth. See BONY PIKE.

Garrick, DAVID (1717-79), English actor and dramatist, born at Hereford. He was a pupil of Samuel Johnson, and in 1737 Johnson and Garrick went to London together. On Oct. 19, 1741, Garrick appeared at Goodman's Fields as Richard III., achieving success immediate and extraordinary. From 1742 to 1745 he continued to appear at Drury Lane Theatre, of which he became, with Lacy, joint-proprietor (1747). His connection with Drury Lane was unbroken during thirty years (1747-76) of unvarying popularity and unrivalled success. His versatility was extraordinary. In June 1776 he sold half his share in Drury Lane Theatre for £35,000, and retired from the stage. He was buried in Westminster Abbey. Garrick elevated the whole tone of the stage, substituted for the old stilted and declamatory style one more vivacious and natural, and greatly increased the popularity of Shakespearean performances. Among his plays are *The Lying Valet* and *The Clandestine Marriage* (jointly with Colman). See Garrick's *Correspondence*, with Memoir (1832); *Life* by Percy Fitzgerald (1868), and by Knight (1894).

Garrick Theatre, London, was opened on April 24, 1889, by Mr. John Hare. A distinction must be made between Mr. Hare's house and the Garrick Theatre founded in 1830 in Whitechapel, which, after being rebuilt in 1845, was used for *opéra bouffe* as recently as 1879. During Mr. Hare's opening season *The Profigate*, by Mr. Arthur Pinero, was produced. The most important piece of the next season was *A Pair of Spectacles*, by Mr. Sydney Grundy. During 1891 Mr. A. W. Pinero's *Lady Bountiful* was followed by a revival of Robertson's *School*, and in 1892 by Mr. Sydney Grundy's *A Fool's Paradise*. *The Notorious Mrs. Ebbsmith*, by Mr. Pinero, was staged in March 1895. In July Madame Rejane visited the theatre, and produced *Madame Sans-Gêne* and *Ma Cousine*. In April 1896 *The Rogue's Comedy*, by Henry A. Jones, and *The Greatest of these*, by Mr. Sydney Grundy, were the chief presenta-

tions. More recent productions have been Mr. Anthony Hope's *Pinkerton's Peerage* (1902); Madame Sarah Bernhardt's appearance in *Francesca da Rimini* (June 1902); Mr. H. A. Jones's *Whitewashing Julia* (1903); and the adaptation from the French, *The Arm of the Law* (1904).

Garrison, WILLIAM LLOYD, (1805-79), American abolitionist, born at Newburyport, Massachusetts, and (1826) became editor of the *Newburyport Free Press*. Then he started (1831), at Boston, the *Liberator*, which he conducted for thirty-four years, until slavery was abolished in the United States. To the cause of abolition he devoted his whole energies, and in the course of the long campaign was fined and imprisoned, and once barely escaped death. He helped to found the American Anti-Slavery Society, and was its president from 1843 to 1865. He was also deeply interested in temperance. He visited England in 1833, 1840, 1846, 1848, and finally in 1877. See *Life* by his children (4 vols. 1885-9), also by O. Johnson (1880).

Garrod, SIR ALFRED BARING (1819), English physician, born at Ipswich; appointed professor at University College Hospital, London (1851), physician at King's College Hospital, London (1863), and physician extraordinary to Queen Victoria (1896). A leading student of gout and other disorders associated with uric acid, he was the first to use lithia internally. See his *Nature and Treatment of Gout and Rheumatic Gout* (1860).

Garrotte, the Spanish method of capital punishment by strangulation. The criminal, seated upon a scaffold, is fastened to an upright post by an iron collar, and a knob worked by a screw dislocates the spinal column, thus causing death. Highway robbery performed by throttling the victim is called 'garrotting.' It was prevalent in London and elsewhere in 1862-3, until severe sentences coupled with flogging put a stop to it.

Garrucha, seapt, Spain, on the Mediterranean, 40 m. N.E. of Almería; exports iron, lead and copper ores, esparto, and fruits. Pop. (1900) 4,661.

Garrus, or GERUS, prov., Persia, between Azerbaijan and Hamadan. Its capital is Bijar. Pop. 80,000.

Garrya, a genus of evergreen shrubs belonging to the order Cornaceæ. They are easily grown in sheltered situations in Britain. The long, drooping catkins in spring are often a foot in length. The best-known species is *G. elliptica*, a native of California, which, grown against a wall or trellis, is very handsome.

Garston, tn. and port on the Mersey, 6 m. S. of Liverpool, Lancashire, England. There are railway docks, bobbin, iron, and copper works. Pop. (1901) 17,289.

Garter, ORDER OF THE. See ORDERS OF KNIGHTHOOD.

Garter King-of-Arms, the herald of the order of the Garter. See HERALDRY.

Garth, SIR SAMUEL (1661-1719), English physician and poet, was born at Bowland Forest, Yorkshire, and became a popular physician in London. He delivered the Harveian oration for 1697. In 1699, with Dryden's *MacFlecknoe* and Boileau's *Lutrin* for models, he published his mock-heroic poem *The Dispensary*, the satire of which is pungent, and the heroic couplets the best produced between Dryden and Pope. A member of the Kitcat Club, he wrote nimble verses for its 'toasting glasses.' In 1717 he edited a translation by several writers of Ovid's *Metamorphoses*. Garth's *Poems* are in Chalmers's *English Poets* (1810), vol. ix.

Gartok, tn., W. Tibet, cap. of Nari-Khorsum prov., over 14,000 ft. above sea-level, in an outlying valley of the Himalayas. The richest gold field of Tibet, Thok-Jalung, lies N.E., in 32° 30' N.

Gartsherrie. See COAT-BRIDGE.

Garua, thick fog in the rainless regions along the Peruvian coast. It usually prevails after a very sultry summer.

Gas. The public supply of gas in England is governed by the Gasworks Clauses Acts, 1847 and 1871, the Sale of Gas Act, 1859, and the Gas and Water Facilities Act, 1870, and in London by the Metropolitan Gas Act, 1860, in addition to many private acts. Gas companies are generally bound to sell gas within their district of a certain standard of purity and illuminating power at a price which is generally regulated by a sliding scale. The sale is by meter, which may be examined by the company, and tested by the local authority in the interests of the customer. Gas companies are liable to a penalty of £5 a day for allowing gas to escape, and are subject to the ordinary law of nuisances. Under the Public Health Act, 1875, an urban authority outside the metropolis may, by special resolution and leave of the Local Government Board, either buy an existing gas undertaking, or, if no competition exists, create a new one. In Scotland gas is governed by the Sale of Gas (Scotland) Act, 1864, and the Burgh Gas Supply Acts, 1876 and 1893, in addition to the statutes already noticed. See Michael and Will's *Gas, Water, and Electric Lighting* (5th ed. 1901).

Gas-engines. The motive-power in a gas-engine is obtained by the combustion of an explosive mixture of gas and air inside the motor cylinder; hence gas-engines are called 'internal combustion' engines, in contradistinction to steam-engines, in which the working agent—steam—is produced separately. The thermal efficiency, or the ratio of the heat transformed into mechanical work as compared with the total heat supplied, is much greater in a gas-engine than in a steam-engine and boiler. A small-power gas-engine using ordinary town gas is also much more economical than a similar-sized steam-engine and boiler; but with large units using town gas the reverse is the case. However, gas-engines of very large power are now worked with a cheap form of producer gas, with the result that they are far more economical than the very best designed steam-engines and boilers.

The first practical working gas-engine was brought out by Lenoir in 1860. In construction it was similar to the ordinary horizontal double-acting steam-engine. Two slide-valves worked by eccentrics were provided. One slide-valve controlled the admission of gas and air, while the other, on the opposite side of the cylinder, allowed the products of combustion to escape to the atmosphere at the proper moment. To prevent the cylinder from becoming excessively hot, it was fitted with a water jacket. The working of the Lenoir engine was as follows. Alternately at each end of the cylinder air and gas, in suitable proportions, were drawn in; at about half-stroke the inlet valve was closed, and the mixture immediately exploded, at about atmospheric pressure, by an electric spark. The explosion produced a rapid rise of pressure, and forced the piston to the end of the stroke, at the same time expelling from the cylinder the products of combustion on the opposite side of the piston. An indicator diagram from a Lenoir engine is shown in Fig. 1. On account of the excessive consumption of gas (about 100 cub. ft. per horse-power per hour) this engine was soon discarded.

In 1866 Otto and Langen introduced their atmospheric and free piston gas-engine, which consisted of a very tall vertical cylinder, open at the top and provided with a piston, whose rod was formed like a rack, and geared with a spur wheel on the main shaft, driving it by means of a very ingenious clutch gear only during the down stroke of the piston. On the ignition of the charge by a gas flame the piston rose freely, the expansion being

very rapid, and the pressure fell below that of the atmosphere. On the down stroke the clutch came into action, and the shaft received mechanical energy. The Otto and Langen worked much more



FIG. 1.—Lenoir Cycle Diagram.

economically than any previous engine, the consumption of gas being about 44 cub. ft. per brake horse-power per hour. Otto himself, in 1876, brought out an entirely new design. The important innovation in the Otto engine was the compression in the motor cylinder of the charge of gas and air prior to ignition, and from this period the gas-engine became a serious competitor to the steam-engine. Dr. Otto was not the original inventor of the compression principle. Beau de Rochas, in 1862, laid down the precise principles upon which the best modern gas-engines are working, but Otto converted the theory into a practical success.

The four-stroke cycle of Beau de Rochas and Otto, commonly known as the Otto cycle, may be best followed in Fig. 2 (after Norris), which represents a longitudinal section of a modern gas-engine in diagrammatic form. During the first forward or *charging* stroke of the cycle, gas and air are drawn into the cylinder by the suction of the piston. On the return or *compression* stroke the mixture is compressed into the clearance space, which is usually about 30 per cent. of the working volume of the cylinder. The charge is then ignited as the

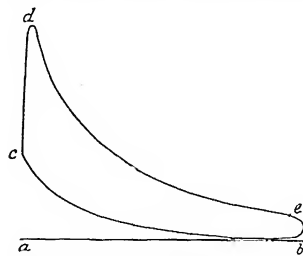


FIG. 3.—Otto Cycle Diagram.

a to *b*, charging stroke; *b* to *c*, compression stroke. Ignition takes place at *c*, the pressure rising to *d*; *d* to *e*, expansion or working stroke; *e* to *a*, exhaust stroke.

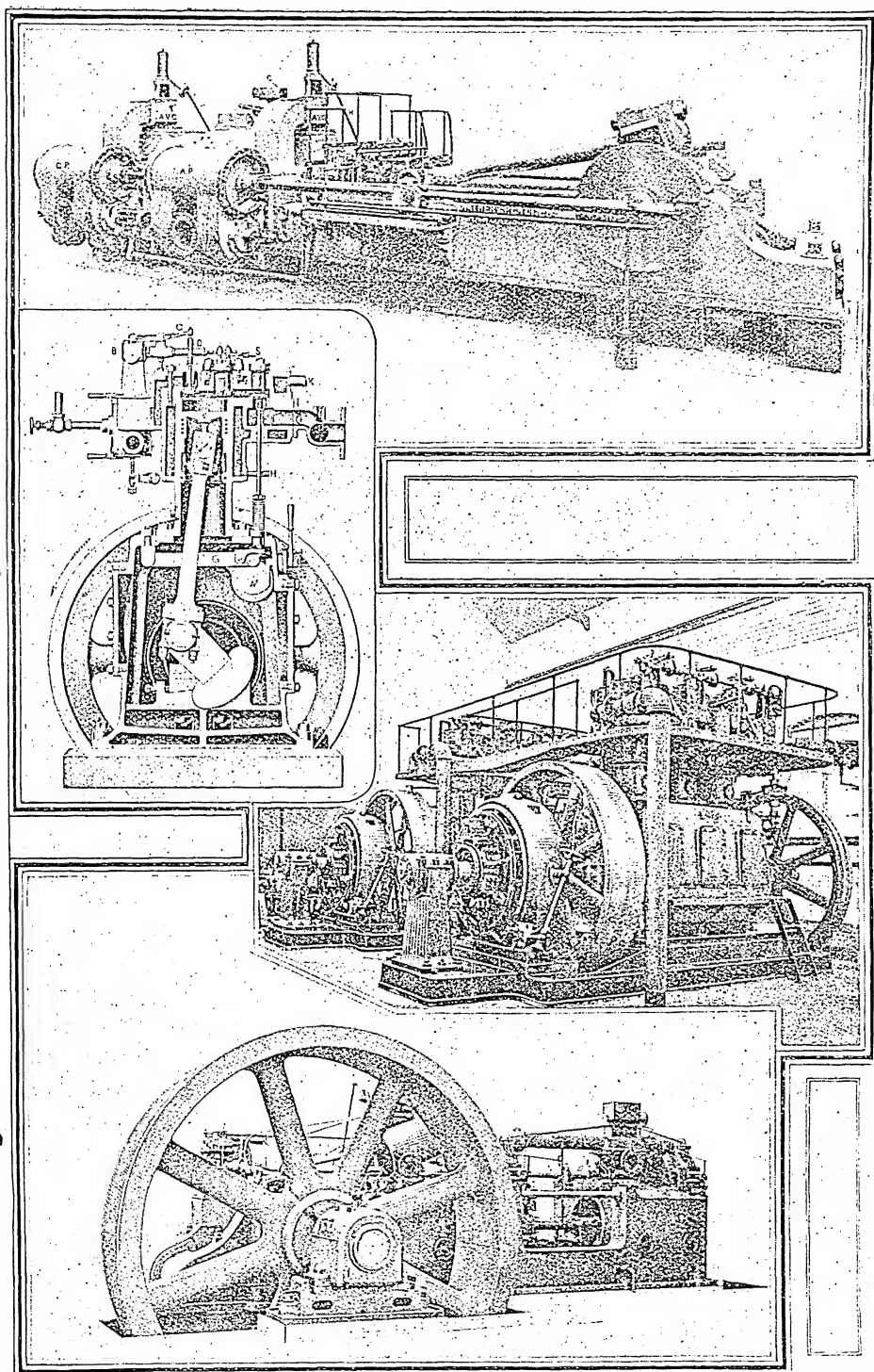
crank reaches a dead point, an explosion takes place, and the third or *working* stroke is performed under the pressure of the heated products of combustion. During the next return or *exhaust*

stroke the above products are expelled from the cylinder into the atmosphere. Thus to complete the action requires four strokes of the piston, or two revolutions of the crank shaft (Fig. 3).

Most modern gas-engines are single-acting, and work on the Otto cycle, although within the last few years there has been a tendency to revert to gas-engines which have a greater frequency of impulse than one per two revolutions when running under full load. The original Otto engine was of the horizontal type, the cylinder being open at the crank end, and provided at the back end with a slide-valve, which was made to move transversely by means of a side lay shaft running at half the speed of the crank shaft. This slide-valve controlled the admission of gas and air, and the ignition of the charge was effected by carrying a flame, through a narrow port in the slide-valve, from a gas jet which was kept burning outside. The products of combustion were discharged through a separate valve of the mushroom type, operated from a cam on the side shaft. On account of the greater pressures which are now common, the slide-valve has been replaced by lift-valves of the mushroom type, as shown in Fig. 2. The slide-valve is also not suitable for working at a high temperature. Low compression and flame ignition have given place to high compression and tube ignition. A tube igniter consists of a small closed tube of metal or porcelain, which is maintained at a bright-red heat by a flame playing on its outside surface, while a portion of the explosive mixture is allowed to enter the tube from the cylinder at the time when it should be fired. In most of the large gas-engines worked with producer gas, electrical means of firing are used.

Gas-engine pistons are invariably of the trunk type, and the cylinders are kept cool enough to admit of lubrication, by means of jackets through which a continuous circulation of water is maintained. In large gas-engines the pistons and exhaust valves are also water-cooled. This is done in order to prevent pre-ignition in consequence of the excessive heating of the piston, etc.; also, with a water-cooled piston a much tighter fit can be obtained in the cylinder, as the amount of expansion is very small owing to the temperature of the piston being kept fairly constant.

The speed of a gas-engine is usually regulated by a centrifugal governor, which acts on the gas valve so as to cut off the supply when the speed exceeds a certain limit, causing the engine to miss



Gas-Engines—Figs. 5, 6, 7, 9.
(For explanation of Figs. see text.)

one or more explosions. This is termed the 'hit and miss' principle. The charge of gas and air admitted into the cylinder is the same in amount whatever the load, and the impulses are consequently of approximately uniform intensity, but are varied in frequency to suit changes in the

cycle there is a considerable volume of products of combustion retained in the clearance space of the cylinder at the end of each exhaust stroke, but most modern engines are so arranged that the cylinder is effectually cleared of the exhaust gases. The sweeping out of the exhaust

Probably the greatest advance that has been made since 1889 in connection with the development of the gas-engine is in the use of producer and blast-furnace gas for motive-power purposes. (See FUELS.) The heating value of producer gas is only about one-fourth that of the average coal gas used for illuminating purposes; but it can be made very cheaply, and it enables the gas-engine to provide power at a cost much less than in the case of a steam-engine. The Mond process is specially adapted for the use of a cheap fuel (bituminous slack) and the recovery of ammonia. Many engines of very large power are now in successful operation with blast-furnace waste gas in Great Britain, in Belgium, and in Germany.

With gas-engines of large size it is necessary to provide some suitable mechanical or other means for setting the engine into motion. In some an explosive charge of gas and air is introduced into the cylinder, the pressure produced by the explosion of the charge being sufficient to start the piston. Another method is, by a suitable arrangement of valves, to convert the engine for a short time before stopping into an air-compressor. Other gas-engines are provided with a small barring-engine, which drives the main engine through a pinion gearing with teeth formed on the fly-wheel rim.

The Körting gas-engine is double-acting. Fig. 4 shows a diagrammatic horizontal section through the motor cylinder and the two pump cylinders, one of which supplies air and the other gas. The pumps are driven by an auxiliary crank set at 110 degrees ahead of the main crank, and are provided with piston valves V, driven by an ordinary eccentric on the crank shaft. Separate pipes convey the gas and air into openings in front of the admission valves A. The length of the piston B is practically half that of the motor cylinder. There is no separate exhaust valve, but the motor piston acts in that capacity. The exhaust ports E are situated at the centre of the cylinder, and are uncovered when the piston is at either end of its stroke. When in that position, a scavenging charge of air from the air-pump sweeps out the products of combustion. In Fig. 4 the piston has not reached the end of its stroke; consequently the exhaust ports are not uncovered. After the burnt products have been displaced, a mixture of gas and air is pumped into the cylinder. On the return stroke, as soon as the exhaust ports are covered, compression begins; and finally, when the crank is on its

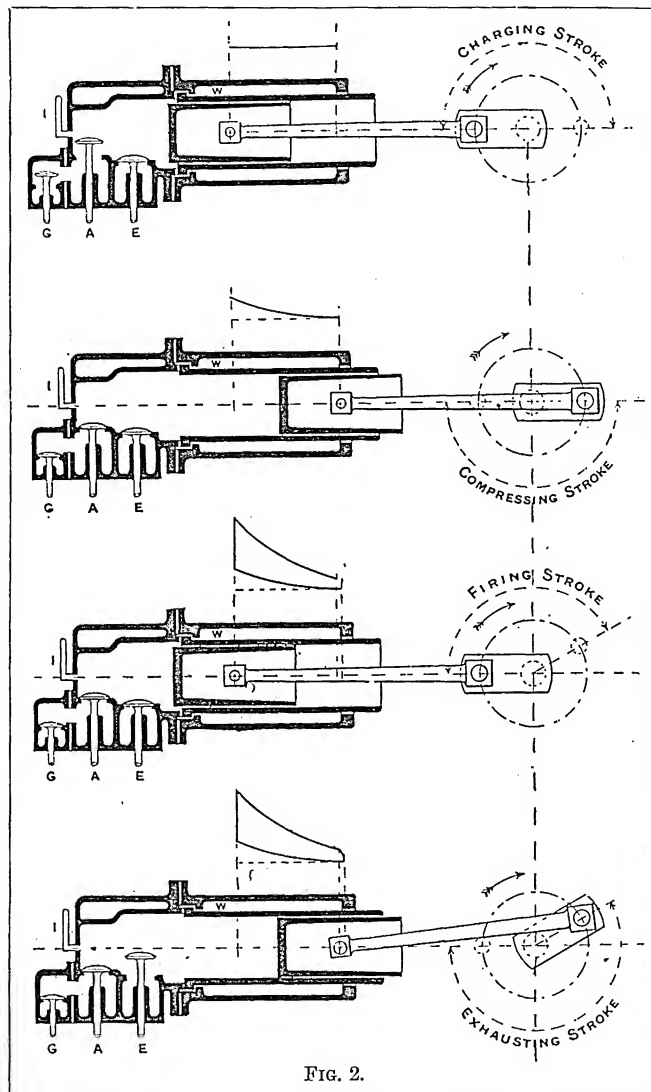


FIG. 2.

load. In some engines, where extreme regularity of working is necessary, a modification is made whereby the *amount* of the explosive mixture is controlled, and an impulse takes place at *every* cycle. This method of governing is known as the 'throttling' system.

When working on the Otto

gases or 'scavenging,' as it is generally termed, is effected in various ways. In some engines air is forced into the cylinder by a separate air-pump or other equivalent. In the Crossley engine the result is obtained by using an exhaust pipe at least 65 ft. in length.

dead centre, ignition takes place, and the working stroke is made. Both sides of the piston are utilized, and thus two impulses are obtained for each revolution of the crank. The turning moment on the crank shaft approaches in evenness to that obtained with a double-acting steam-engine. The speed is regulated through a governor, which acts on a by-pass valve in the gas suction in such a manner that more or less gas is returned to the main gas-pipe, and only a portion of the pump volume is delivered into the motor cylinder, according to the work to be done. The ignition is brought about electrically. The cylinder, piston, and valves are all cooled by water. These engines are made in sizes up to 2,000-horse power, and are worked with producer or blast-furnace gas. A Körting engine capable of developing 700-horse power is shown in Fig. 5. The cylinder is 29½ in. in diameter, with a stroke of 51½ in. and a speed of about 86 revolutions per minute. In the illustration the fly-wheel has been omitted, but the positions of the gas and air pumps and admission valves, etc., are clearly indicated: G.P., gas-pump; A.P., air-pump; A.V.C., admission valve casing; E., exhaust; G., governor; H., rods for operating admission valves.

In the Westinghouse engine, which is of the vertical type, there are two or three cylinders and the Beau de Rochas cycle is used in each cylinder. The two-cylinder engine receives one impulse per revolution, and the three-cylinder engine one impulse for every two-thirds of a revolution. A vertical section through one cylinder of a three-

The charge is compressed into the clearance space on the return upward stroke; and when the crank is just passing the upper dead centre, the charge is ignited by an electric spark, which passes between the terminals fixed in an igniter plug F. There are two pairs of sparking points, one pair being reserved for emergency. The working stroke is then made, and on the next return stroke

air remain constant. Should it be necessary, however, to alter the strength of the charge, means are provided by which the area of the gas and air openings in the regulator can be varied while the engine is running.

A small plant consisting of two 250 B.H.P. Westinghouse gas-engines coupled direct to two dynamos is shown in Fig. 7. In the United States, Westinghouse

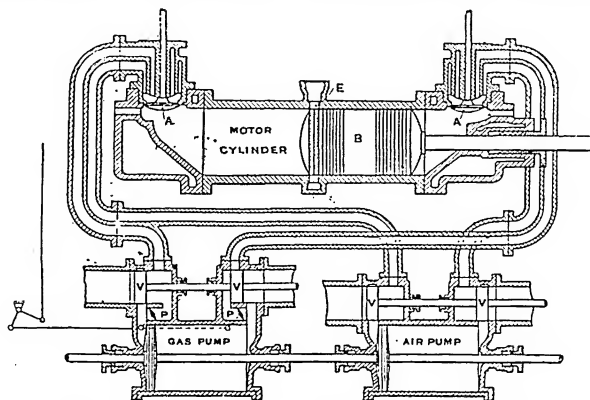


FIG. 4.—Körting Gas-engine: diagrammatic section.

the exhaust valve E is opened through a cam on an auxiliary shaft A acting on a lever G, and the burnt gases are discharged into the exhaust-pipe O. The shaft A is driven from the main shaft by the usual two-to-one gearing. Motion is transmitted from the shaft A to a shaft B, which carries a cam for opening the inlet valve J by means of a lever C. The governor is of the

engines of 600 to 1,500 B.H.P. are working very successfully with natural gas, which has a heating value of about 1,000 B.T.U. per cubic foot; and when using about 10 cub. ft. per brake horse power per hour, the heat efficiency appears to be 25 per cent.

The Premier gas-engine, which is of the positive scavenger type, is shown in sectional elevation

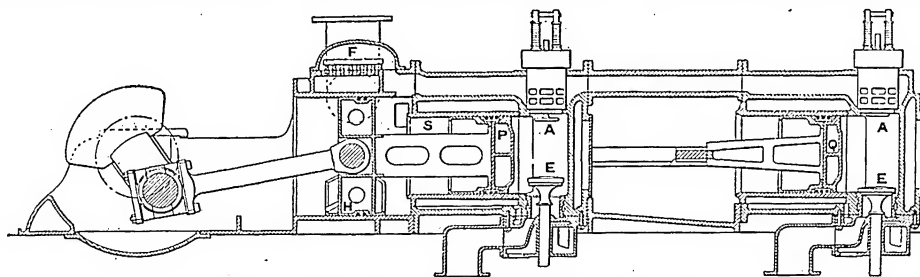


FIG. 8.—Premier Gas-engine: section through cylinder.

cylinder engine is shown in Fig. 6, all three cylinders being exactly alike. The gas and air, in proper proportions, enter a mixing chamber M by separate inlets, and the mixture passes through a port N to a space in the cylinder head in which the inlet valve J is situated. On the down stroke of the piston the inlet valve is open, and the charge of gas and air is drawn into the cylinder.

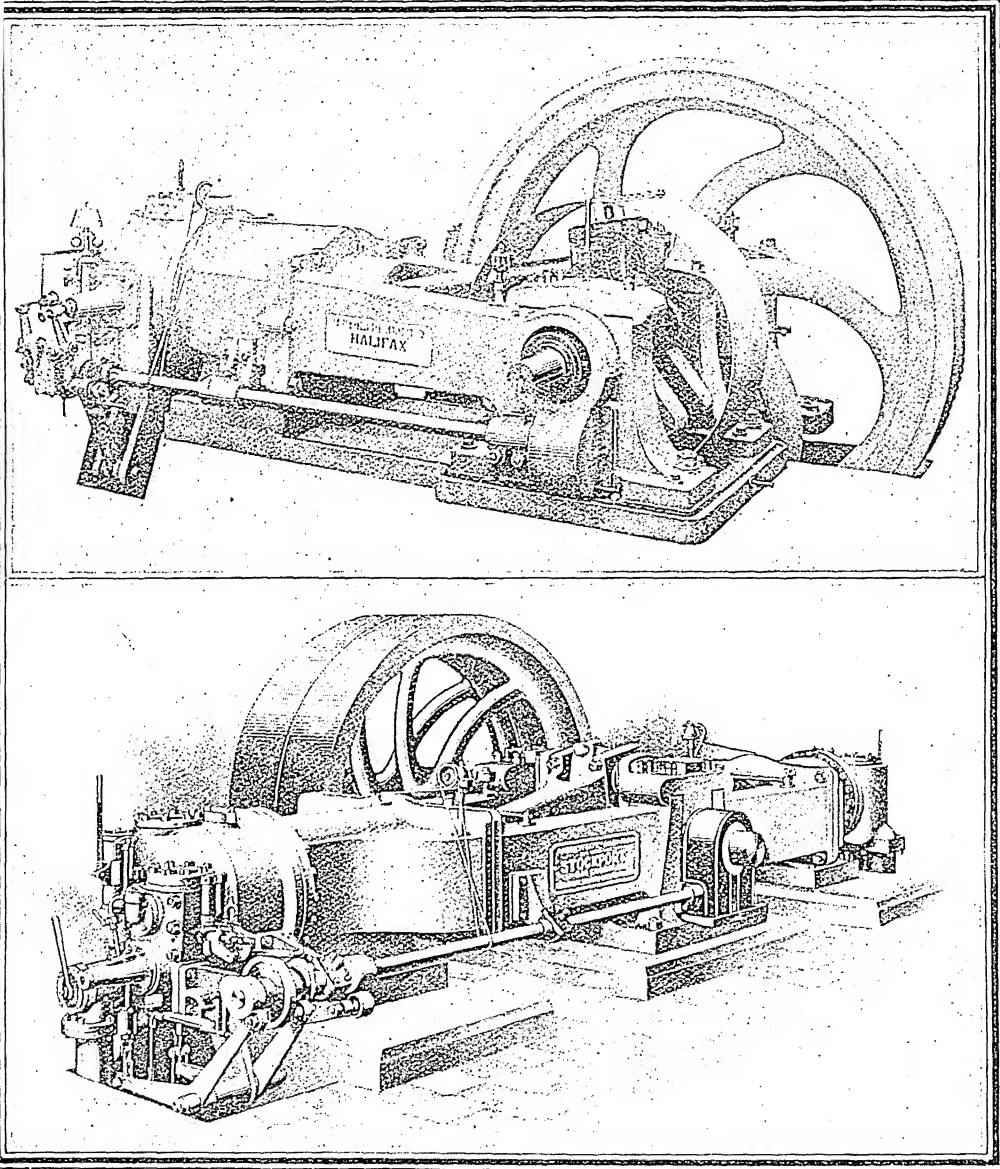
centrifugal type, and acts upon a regulator valve, which controls the admission of both gas and air to the mixing chamber. As the load on the engine changes, the regulating valve moves up or down, increasing or decreasing the quantity of the mixture without altering its quality. The frequency of the impulses is thus the same for all loads, and the relative proportions of gas and

in Fig. 8. There are two motor cylinders placed one behind the other, and the ordinary four-stroke cycle is used. The back piston Q is connected to the front one P by two side rods attached to a cross-head. The front piston is of the differential type, the large front end H working in the bored part of the bed-plate, and the smaller back end P in the front cylinder. The above-men-

ioned side rods are secured to his enlarged end of the front piston. The annular space S, between the front and back ends of the front piston, forms an air-

out the products of combustion and replacing them by pure air. The valve gear is arranged so that the explosions alternate. The admission valves A are placed

on the crank shaft. In the figure both pistons are making a back stroke; in the front cylinder the scavenging action is taking place, the admission and exhaust valves



Gas-engines—FIGS. 10 and 11.

(For explanation of Figs. see text.)

pump, into which air is drawn on each out stroke, and from which it is discharged on each back stroke through the combustion chamber of either one or other of the motor cylinders, thus clearing

above the cylinders, and the exhaust valves E below, all opening direct into the combustion chamber. The air is admitted through a grid valve F above the air-pump, and is operated by an eccentric

being both open. The charge in the back cylinder is being compressed preparatory to ignition. The governor is driven direct from the crank shaft, and controls the speed by cutting

out ignitions when the load is light.

The illustrations, of which Fig. 9 is an external view, are taken from a 500-horse power engine with cylinders 28½ inches in diameter and 30 inches stroke, with a speed of 128 revolutions per minute.

Fig. 10 represents a Campbell gas-engine, designed to develop 150 B.H.P., using producer gas. The cylinder is 22 inches in diameter and 30 inches stroke; speed, 160 revolutions per minute. When working with producer gas having a heat value of 135 to 150 B.T.U. per cubic foot, the compression pressure is 130 lbs. per square inch. To permit of this high compression pressure, the piston is provided with a water-cooled chamber at one end, through which there is a constant circulation of water. The exhaust valve is also water-cooled by a constant circulation through the spindle and valve head. The water is finally passed into the exhaust pipe for the purpose of condensing the exhaust gases, and so help to reduce to a minimum the noise of the exhaust. The governing is effected solely on the gas valve, and is on the 'hit and miss' principle. The ignition is of the magneto-electric type. The engine is fitted with a small magneto-electric machine, composed of permanent magnets, between the poles of which a slotted armature is reciprocated, and tripped when required by means of a cam and trip lever. At the moment of the tripping of the armature the contact is broken between an insulated plug and a contact breaker, causing a spark of high voltage to pass between the firing points within the combustion chamber.

A double-cylinder Stockport gas-engine is illustrated in Fig. 11. The cylinders are each 20 inches in diameter and 30 inches stroke; speed, 165 revolutions per minute. The ordinary Otto cycle is used. With town gas—600 to 650 B.T.U. per cubic foot—this engine will develop a maximum of 310 B.H.P., or 280 B.H.P. working load. With Dowson gas of about 160 B.T.U. per cubic foot, it is capable of exerting a maximum load of 280 B.H.P. The ignition is electric; a small magneto-electric generator (not shown in the above illustration) is placed over and worked from the cam shaft of the engine. A cast-iron plug is fitted to the combustion chamber, and in this there are two spindles—one fixed and insulated, and connected directly to the electric generator; the other constructed so as to revolve. At the moment when a spark is required a cam on the side shaft releases a lever, which strikes one of the spindles, breaking con-

tact and causing a spark. Provision is made for altering the time of ignition when starting the engine. A special form of trunk piston is used, in which the spring rings are separated by loose intermediate or junk rings, and the whole is held in position by junk covers. This form of double-cylinder engine is much used by various makers for large powers. The exhaust valves work vertically, and are water-cooled. See *The Gas and Oil Engine*, by D. Clerk (8th ed. 1899); *Gas, Oil, and Air Engines*, by Bryan Donkin (1894); *Modern Gas and Oil Engines*, by Grover 1897; *The Gas-Engine*, by Norris (1896); *Gas and Petroleum Engines*, by W. Robinson (1902). See also OIL AND PETROL ENGINES; DIESEL ENGINE.

Gases and Vapours. The distinction between a gas and a vapour has, since the classical researches of Andrews (1869), become a useful scientific one. They are alike in being fluids—i.e. they cannot sustain a steady longitudinal stress without lateral support, or, less strictly, they cannot maintain under the influence of gravity a constant shape unless they are enclosed in a vessel, the shape of which they take. They are distinguished from liquids by the fact that, while a liquid need not occupy the whole volume of the containing vessel, a gas or vapour distributes itself throughout the entire space available. Before the experiments of Andrews (and, in fact, commonly still) one spoke of the vapour of ether, but carbon dioxide was regarded as a gas, though in the strictest sense the latter is not a gas except in the hottest days of summer. The distinction in former times seems to have depended on the fact that liquid ether was commonly, but liquid carbon dioxide seldom, seen, simply because their boiling-points are respectively above and below the usual temperature of our climate—a trivial circumstance, of but little scientific interest. Andrews's apparatus (Fig. 1) consisted of a compression tube, the upper part of which, C, was of glass, in which the gas experimented on (carbon dioxide) was enclosed, and which could be surrounded by a bath to maintain any constant temperature. The lower part of the tube, D, was of iron, completely filled with water, and a steel screw, S, could be screwed into the bottom to produce any pressure up to 400 atmospheres. The gas was separated from the water by a short thread of mercury, and the position of the mercury indicated the volume, V, of the gas. The pressure, P, was measured by observing the volume of a quantity of air contained in a pre-

cisely similar tube connected with the first. As the compressibility of air was known from previous researches, the apparatus was capable of determining the isothermals for carbon dioxide—i.e. the relation between P and V at

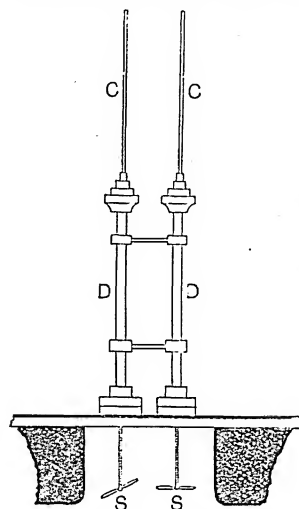


FIG. 1.—Andrews's Apparatus for liquefaction of Carbon Dioxide.

any desired temperature, namely, that of the enclosing bath.

The nature of the results is shown by the diagram, where the curves refer to different temperatures. At high temperatures—for instance, 50° C.—the result (curve 9) is a fairly uniform curve, approximating to a rectangular

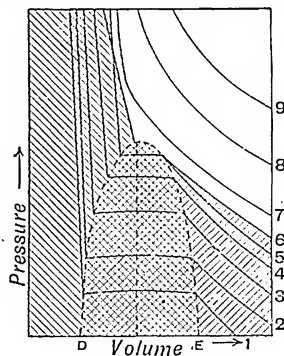


FIG. 2.

hyperbola, the curve given by the more perfect gases, such as air, oxygen, hydrogen, etc. No liquefaction took place, or could take place, no matter how much the pressure might be increased. At a temperature of 31° C. (curve 6) an unmistakable bend takes place, and the gas just escapes

liquefaction. This is the *critical temperature* for carbon dioxide. At lower temperatures, as $5^{\circ}\text{C}.$, liquefaction just begins to set in at the point E. From this point, so long as the temperature remains constant, no increase of pressure can take place (Dalton's

considerably different at this temperature, but at higher temperatures they become more nearly equal, till at the critical temperature the volumes of the substance as liquid and vapour are equal—i.e. the densities are equal—and the liquid and vapour

the tube become homogeneous. On reversing the process by cooling the tube, a sort of shower appears in the upper part, and the meniscus is re-formed. We may therefore gather that above a certain temperature a gas is incapable of liquefaction. The volume might, by increased pressure, be made smaller and smaller (even less than that which the substance might have in the liquid form), but the separation of liquid would not take place. It is a true or 'permanent' gas above this temperature, whilst below it it is a vapour, sufficient pressure only being required to produce liquefaction.

Liquefaction of Gases.—Thus a gas may be liquefied when its temperature is below its critical point, if it is subjected to those conditions that cause the condensation of any vapour. These conditions are simply that the external pressure should be larger than the vapour pressure of the liquid; a state of affairs that can be attained in two ways—viz. by increasing the external pressure by compression pumps, or by decreasing the vapour pressure by cooling.

According to these principles, gases of which the critical point is above ordinary temperatures can be liquefied by compression alone, though the pressure required may be reduced by cooling; whilst those of low critical point must be cooled, and are usually liquefied at atmospheric pressure. Thus Faraday, who was the pioneer in this field, liquefied the more easily condensible gases by the first method, making the gas in a closed A-shaped tube, so that the pressure caused by its evolution, aided by the cooling of one limb of the tube in a freezing mixture, was sufficient to bring about its condensation. The method was much elaborated by Pictet, who produced a considerable lowering of temperature by the successive liquefaction and evaporation of the more easily condensible gases, such as sulphur dioxide and carbon dioxide, and at the boiling-point of the latter, under reduced pressure, succeeded in effecting the liquefaction of oxygen. The method of compression is still used for the commercial preparation of liquid sulphur dioxide, carbon dioxide, nitrous oxide, etc., which are sold as such in strong steel bottles.

The production of the gases that are with the greatest difficulty liquefied, even in large quantity, has been effected within the last ten years by the application of a discovery of Joule and Lord Kelvin, also of

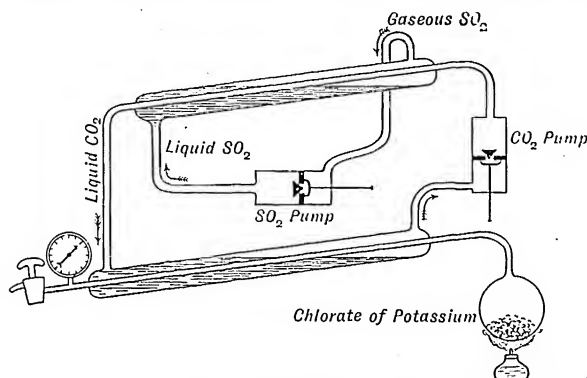


FIG. 3.—Pictet's Apparatus.

law for saturated vapours). The condensation goes on, therefore, along a horizontal line, till at the point D the substance is all liquid. A liquid is highly incompressible, and so from this point the curve rises very steeply. The area can be divided into four regions, indicated by the various shadings. Lines sloping downwards from left to right indicate the liquid state; upwards from

need not separate, but either might float in the other. This may be observed in an experiment first devised by Cagniard de la Tour, in which a stout-walled glass tube is two-thirds filled with liquid sulphur dioxide and sealed up; the space above the liquid is filled with the gas. If then the tube is heated up in a bath of a liquid like glycerin, the liquid sulphur dioxide will

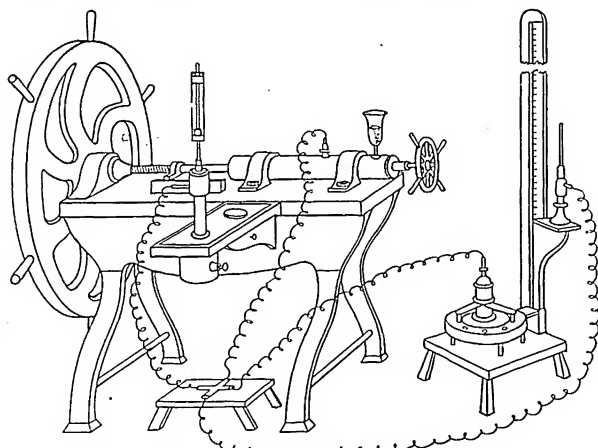


FIG. 4.—Cailliet's Apparatus.

left to right, vapour. We see, therefore, that there is a cross-hatched region in which liquid and vapour exist in equilibrium. The volumes indicated by the points D and E are the volumes of the substance as liquid and vapour respectively. They are

be seen to expand until the critical temperature ($156^{\circ}\text{C}.$) is reached, when the meniscus dividing the gas from the liquid becomes indistinct and disappears. At the same time striae are seen in its place, but they soon vanish, and the contents of

a thermo-dynamical character, that when a gas is forced through a small aperture or porous plug it is perceptibly cooled. The effect, known as the Joule-Thomson effect, is small, being only $.25^{\circ}\text{C}$. for air at ordinary temperature, with a difference of 1 atmosphere pressure on each side of the aperture; but as it varies directly with the difference of pressure, and inversely as the square of the absolute temperature, it is much more effective the lower the temperature and the greater the pressure.

Apparatus on this principle has been devised by Linde on the Continent and Hampson in

trols the opening of the jet at which the compressed air escapes. After expansion the cooled air flows out either over the outside of the spirals, or through concentric ones, cooling the incoming gas so effectively that the final temperature of the escaping gas is only a degree or so lower than the temperature of that entering. When the temperature at the jet reaches the liquefying point, a large proportion of air liquefies, trickles down, and is collected in a 'vacuum vessel,' or vessel with double walls, from between which the air is exhausted as perfectly as possible. By working in this way, with a three-horse power motor driving the compression pumps that deliver the air at 170 atmosphere pressure, liquid air is obtained in about four minutes, at a rate of about 1 to $1\frac{1}{2}$ litres ($1\frac{1}{2}$ to 2½ pints) per hour.

With hydrogen, the Joule-Thomson method does not cause cooling of the gas at ordinary or even much lower temperatures, and it is only when the gas is cooled to well below -80°C . that the method is really effective. It is carried out by cooling the hydrogen, first by a freezing mixture of solid carbon dioxide and alcohol, and then by liquid air boiling under reduced pressure, so that it reaches -200°C ., and then expanding it in an apparatus similar to that used for air when it liquefies in the same manner. By evaporating liquid hydrogen it is possible to produce the lowest temperatures known, and thus to liquefy or solidify those gases which can only be obtained in small quantities, or, like fluorine, are of a very corrosive nature. Liquid hydrogen has also been suggested as a means of producing high vacua, the air in the vessel to be exhausted being condensed in a portion that can be sealed off before it is removed from the cooling influence. See Hardin's *Liquefaction of Gases* (1899); Travers's *Study of Gases* (1901); Dewar's 'Bakerian Lecture to the Royal Society,' in *Proc. Roy. Soc.* (1901); and *British Association Inaugural Address* (1902).

LAWS OF GASES.—The most important laws of gases are those which relate to the effects on them of pressure and temperature changes. Two peculiarities characterize gases in this respect. (1.) When a given quantity of gas is brought to a definite pressure and temperature, there is no ambiguity as to its other properties, as, for instance, volume, internal energy, entropy. (Contrast the case of a piece of iron, which may, under the same pressure and temperature, be hard-drawn, annealed, magnetized, or otherwise

different as regards its internal properties.) (2.) Gases are extremely susceptible to changes of volume under the effects of increase of pressure or temperature. In other words, their compressibilities and coefficients of expansion are relatively very great.

Boyle's Law.—Since gases must be always contained in a closed vessel, if changes of volume are to be studied the vessel must be closed by a movable piston or plug; and for this purpose mercury is eminently suitable, as it also provides an easy means of varying pressures. The apparatus figured is only a slight modification of the U-tube, by which Robert Boyle, in 1662, proved the important law known in Great Britain by his name, though described on the Continent as Mariotte's law, even among physicists who recognize Boyle's priority of discovery. It consists of a glass U-tube, connected by a

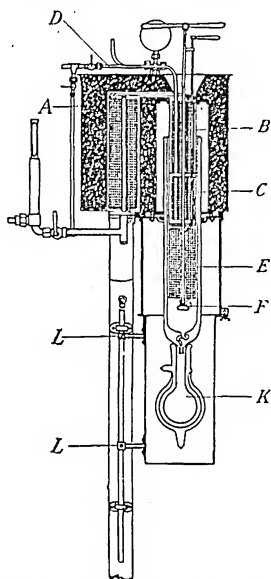


FIG. 5.—Professor Travers's Hydrogen Liquefier.

A, Chamber cooled by hydrogen returning to gas-holder; B, chamber filled with liquid air; C, chamber in which liquid air is evaporated rapidly; D, pipe to exhaust pump; E, regenerator coil; F, escape valve for the compressed hydrogen; K, vacuum vessel; L, slide for lowering box containing the receiver.

England, in which the effect is combined with the regenerative principle—i.e. the cooled gas passes out alongside the entering gas, so that the latter is cooled to the temperature of the former. The temperature of the expanding gas thus becomes lower and lower, until liquefaction takes place, at a pressure only very slightly above that of the atmosphere. The apparatus itself is of the simplest description, compressed purified air furnished by a pump, or even a cylinder of compressed air, being led through spirals of copper tube wound co-axially round a central spindle that con-

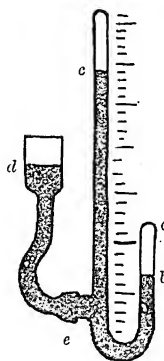


FIG. 6.—Boyle's Apparatus.

flexible rubber tube to a movable reservoir *d*. The gas is imprisoned in *ab* by the mercury. Its volume *ab*, and pressure *cb*, in centimetres of mercury, say, are easily read off on the scale attached, there being no pressure above *c*. If, then, the reservoir *d* is lowered till the pressure—the difference in levels *cb*—becomes halved, it will be found that the volume is doubled; in other words, the volume *v* of a gas varies inversely as the pressure *P*; or, $P \times v$ is constant (at constant temperature)—these alternative statements being known as Boyle's law.

If the law were quite strict, the curves of the product $P \times v$ against *P* in the figure ought to be a horizontal straight line. That would mean that by increasing the pressure sufficiently the volume of a gas could be diminished without limit. But, in fact, in the case of every

gas under increasing pressures (at least when these become great enough), the volume remains larger than is required by the law. In other words, the value of PV increases with increasing pressure, or the curve slopes upwards to the right. For all gases except hydrogen the curve dips down at first. This dip is most marked with gases at temperatures little over their critical point, as, for instance, carbon dioxide, and less and less marked as the temperature is raised. This seems to suggest the infer-

Charles's Law.—The effect of temperature change on a gas may also be studied by means of the apparatus figured in reference to Boyle's law, if we replace the shorter limb of the tube ab by a bulb, enclosed by a bath capable of being heated. We find that the expansion of the gas which takes place has a twofold aspect—a change of volume as the mercury at b is forced down, and a change of pressure consequent on the change of levels. It is inconvenient to consider these two changes simultaneously at first,

quantity, and $\frac{1}{2}$ of its value at 0° . If the experiments were continued below 0° , we should obtain simply the dotted continuation, indicating continually decreasing volumes. If we produce the line to cut the temperature axis, we find the theoretical temperature (-273°C.) at which the volume of the gas would come down to zero (*i.e.* supposing the law to hold at such low temperatures). There can be no lower temperature than this, for there can be no smaller volume than zero; so the temperature may fairly be called the absolute zero of temperature. On the other hand, if we experiment at constant volume and plot pressures, we get a precisely similar law, and practically the same point for absolute zero. From this point of view, the absolute zero is that temperature at which the pressure of all gases would be zero. Neither process of reasoning is quite convincing; for though it is possible to think of the gas molecules lying inert and exerting no pressure, it is difficult to conceive matter occupying zero volume. Again, the regions of temperature in the neighbourhood of the absolute zero are but little explored as regards the effect on the volume of a gas. Such evidence as there is points to alterations in the rate of contraction, thus bringing the zero to another position; but be this as it may, there is excellent evidence deduced from thermodynamical principles that a body at a temperature within a fraction of a degree of -273°C. would be without heat, and so at the absolute zero of temperature. We may therefore conclude that if we could deal with a 'perfect gas,' of which the molecules were but centres of force and without attractive action on each other, such a gas would be reduced to zero volume and pressure at -273°C.

If we call temperatures centigrade t , and agree to call temperatures measured from -273°C. absolute temperatures ($T = t + 273^\circ$), it is obvious that the ordinates in the diagram are proportional to absolute temperatures. The two laws above may be stated as follows: The volume of a gas at constant pressure, or the pressure of a gas at constant volume, is proportional to the absolute temperature. Briefly, the two can be expressed in the simple formula $PV = RT$, where R is a constant. The number 273° used above must not be taken as quite accurate for all gases; but it is remarkable that it is very nearly the same for all gases, more especially for those which used to be called the permanent gases. This is the law

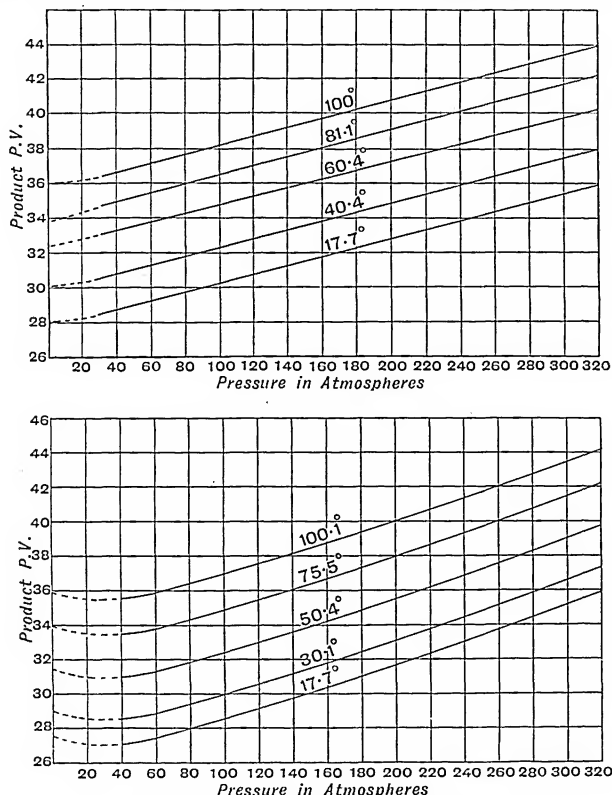


FIG. 7.—Amagat's Curves for Hydrogen.

ence that at temperatures which are high enough every gas would show a deviation like that exhibited by hydrogen. The results figured have been obtained by Amagat working to pressures of 300 atmospheres, but for ordinary pressures the deviations are very small. Thus, for air up to 12 atmospheres the value of PV only decreases by about 6 per cent. over the whole range, and the deviation for nitrogen is about the same. For carbon dioxide, on the other hand, the corresponding amount is 15 per cent. decrease.

and so we may imagine the reservoir d manipulated so as to restore either (1) the original pressure—*i.e.* the same difference of levels cb —or (2) the same volume ab . Thus, we consider a rise of temperature as having the effect of either (1) increasing the volume at constant pressure, or (2) increasing the pressure at constant volume. If we take the first case, and work between the temperatures 0° and 100°C. , the results when plotted will give the full straight line in the accompanying diagram. (Fig. 8.) The increase of V per degree is a constant

of Charles in its greatest generality.

The following are the values of the coefficients for air ($\alpha = 0.003663$):—Constant pressure: at 1 atmosphere, 0.003671; at 3½ atmospheres, 0.003695. Constant volume: at 1 atmosphere, 0.003665; at 3 atmospheres, 0.003690. For carbon dioxide the differences, as might be expected, are much greater. Thus, for constant pressure the coefficients are: At 1 atmosphere, 0.003710; at 3½ atmospheres, 0.003845.

It may be mentioned that the law of expansion of gases is often known by the name of Gay-Lussac, he having been the first who made experiments to test the accuracy of the law enunciated by Charles. He was also the first to attempt to dry the gases on which he experimented. To the researches of Regnault we are mainly indebted for our accurate knowledge of these laws at the present time.

Diffusion and Effusion of Gases.—Different gases, when brought into contact with each other, do not retain a definite surface of demarcation, but spread into each other—the action taking place not only when there is a free passage between the two gases, but also when they are semi-separated by partitions with minute apertures, such as exist in cracked glasses or in unglazed clay and porcelain. This phenomenon is called diffusion—different gases diffusing, as discovered by Graham, at rates that are inversely proportional to the square roots of their densities. As a consequence, differences of pressure result in those cases where a porous partition is employed that offers considerable resistance to the free flow of gases in the ordinary way, one gas passing in one direction more rapidly than the other gas moves the opposite way.

Effusion of gases is the process in which a gas escapes through a minute hole under the influence of difference of pressure, and is the phenomenon that brings about the state of equilibrium observed in the experiment described above. Effusion is very similar to diffusion, Graham's law of effusion being: Rates of effusion are inversely as the square roots of the densities of the gases if the pressure conditions are the same, and are directly as the square root of the pressure differences if they are different.

The phenomenon of effusion has been employed by Bunsen to compare the density of a gas with that of another gas of known density. A burette-shaped vessel contains the gas experimented on, the lower and open end being

immersed in mercury in a tall cylinder. The upper end is closed by a stopper, below which is fixed a platinum plate pierced by a very small pinhole (about $\frac{1}{16}$ mm. in diameter). At a time observed the stopper is opened, the gas flows out, and the mercury rises in the burette from below. The time is noted which a float on the mercury takes to travel between two marks. The same observation is made on the standard gas, and the densities are taken as being in the ratio of the square roots of the times.

The same phenomenon has been made use of by Lord Rayleigh and Sir William Ramsay to separate argon from nitrogen. The densities are, respectively, 20 and 14; and if the mixture be passed in succession through a number of clay tobacco-pipe stems, outside of which a vacuum is maintained, the nitrogen will escape through the pipe walls more rapidly than the argon, and hence the mixture issuing from the end of each successive pipe stem will be increasingly stronger in argon. The

statement, since it is well known that soda water and sparkling liquors retain more carbonic acid at higher pressures than they can retain when the pressure is released on uncorking. The explanation is that 1 litre does represent a larger weight of carbon dioxide at 2 atmospheres than at 1—by Boyle's law just double, in fact—and at 2 atmospheres water will take up double the amount, but still the same volume of gas. In other words, Boyle's law extends to the case of gases in solution. This accounts for the effervescence of sparkling waters, the evolution of the gas being at first rapid, but becoming slower, so that a considerable time is required for the water to lose the piquancy communicated to it by the excess over the normal of carbon dioxide still held in solution.

A similar phenomenon is exhibited by liquid metals, such as gold and silver, which as they solidify give off absorbed air, leaving a peculiar pitted surface produced in the sputtering or 'spitting.'

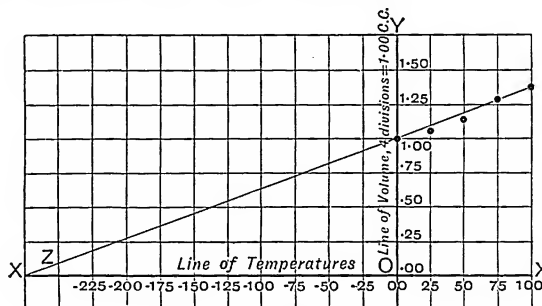


FIG. 8.—Charles's Law.

process is known as *atmolysis*, and corresponds to *dialysis* in the case of a liquid mixture.

Viscosity of Gases.—If any flat solid be moved over another, there is a mutual force tending to prevent this motion. There is a similar action in liquids and gases tending to retard the motion of one layer of the liquid or gas relative to that next to it. But whereas this action in solids is explained by friction, the explanation in the case of gases is quite different. It is simply due to the interchange of molecules between the two layers.

Solubility.—Liquids have the power of absorbing and retaining gases in various proportions for different gases. Thus 1 litre of water at 15° C. can retain 756 litres of ammonia gas, but only 1 litre of carbon dioxide. At higher temperatures the numbers would be smaller. It may seem strange that pressure does not require to be considered in this

Occlusion and Condensation.—If a piece of palladium be used as the cathode of a water voltameter, it will absorb about 900 times its volume of hydrogen gas, and still retain its metallic appearance. Those who would regard hydrogen as a metal would describe this as a kind of alloy of the two metals. The phenomenon is known as *occlusion*.

Almost every solid body possesses the property of condensing gas as an invisible but very tenacious film over its surface. Thus it is impossible to remove completely, even by the most efficient air-pump, the film of air from a vacuum tube. The process is made more effectual, however, if the tube be strongly heated. Even then it has been found necessary to 'wash' out the tube repeatedly with hydrogen, if it is required to have the oxygen completely removed. The amount of condensation is greatest, of course, when the substance is in

a form of aggregation, in which it presents the maximum of surface. Thus box charcoal can be made to occlude about 90 times its volume of ammonia gas.

KINETIC THEORY OF GASES.—In order to account for the pressure which a gas exerts on the walls of the containing vessel, it used to be thought necessary to suppose that the molecules of which the gas was composed were endowed with mutually repelling molecular forces, or behaved like india-rubber balls packed into a bag, compressing one another, and so giving the equivalent of repelling forces. It was first pointed out by Hooke that motion of small particles could account for pressure. Imagine a target hung by the upper edge to be struck by a projectile. The target would sustain an impulse equal to the momentum of the projectile if it fell dead after striking, or twice this if it rebounded with perfect elasticity. The target would show a ballistic deflection, and would then swing back towards its position of rest. But imagine a rapid succession of impulses, very numerous, but none of them very violent; then a steady deflection would be shown by the target, precisely as if it were acted on by a constant force, such as that produced by a current of air. The amount of the pressure would be the sum of all the impulses occurring per second per unit area. If we assume certain simplifications, it is possible to develop this line of argument so as to obtain a very simple form of the fundamental equation. Molecules will impinge on one another as well as on the sides of the vessel, and a certain distance will be travelled between the collisions. The average distance is called the *mean free path*. (1.) Assume that the size of the molecules is negligible, at least in comparison with the mean free path. (2.) Assume that intermolecular forces are negligible, at least in comparison with the effects of velocity. (3.) Assume that the molecules act as perfectly elastic bodies. These are the conditions for the 'perfect gas;' but in actual gases only the third assumption can be strictly realized. Since, when two bodies impinge, the momentum lost by the one is simply communicated to the other, there will be no error in thinking of the molecules as simply passing through one another without collision. Further, the pressure at a point in a gas will not be changed if we suppose an imaginary sphere with an infinitely thin, rigid boundary drawn round the point. Suppose a single molecule of mass m and velocity v to impinge on

the surface and rebound with the same velocity. If it struck normally, the impulse would be $2mv$ (dynamics); but if obliquely, the fraction $\frac{d}{r}$ of the normal impulse

will represent the impulse on the surface. It will then travel the distance $AB (=2d)$ between successive impacts, and will impinge, therefore, $\frac{v}{2d}$ times per second.

The total impulse per second due to this molecule is thus the product of these last three quantities—i.e. $\frac{mv^2}{r}$. Dividing by the area of the spherical surface $4\pi r^2$, we obtain $\frac{mv^2}{4\pi r^3}$. If v be the volume of the sphere $=\frac{4}{3}\pi r^3$, we may write this as $\frac{1}{3}\frac{mv^2}{v}$, the pressure due to a single molecule. If there be n molecules in the sphere, all of equal mass, the total pressure p is n times this—i.e. $\frac{1}{3}\frac{nmv^2}{v}$ (1). v^2 , however, will be different for different molecules, and therefore the v^2

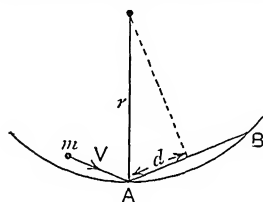


Diagram of Kinetic Theory of Gases.

which occurs in this final result must be understood to be the average of v^2 of all the different molecules. v is, in fact, what is called the *mean square speed*. Now mn is the total mass M of the gas present, and the above may be written $p = \frac{1}{3}\frac{M}{v}v^2$ (2).

Again, $\frac{M}{v}$ is the density δ , so that we have a still simpler form for the equation—viz. $p = \frac{1}{3}\delta v^2$ (3). Lastly, this equation may be written $pv = \frac{1}{3}Mv^2$ (4), or $pv = \frac{1}{3}mnv^2$ (5). These various forms of the fundamental equation provide the means of deducing many interesting results.

For instance, taking form (3), if the density of a gas at a given pressure be known, the mean square speed for the gas can be calculated at the temperature to which the data refer. Thus for hydrogen at 0°C ., and pressure 760 mm. of mercury, or 1,014,000 dynes per sq. cm., the density is '0000896, and consequently $v = 184,000$ cm. per second. In hydrogen at 0°C . the mean square

speed of the molecule is about 1,840 metres per second—i.e. between five and six times the speed of sound in air. By theoretical and experimental investigations it has been shown that for hydrogen at 0° and 760 mm. pressure the mean free path is '000185 mm., and the number of collisions per second 9,480 millions for a single molecule. Further, if we compare the equations for this theoretical gas with laws discovered experimentally for actual gases, we find (1) an interpretation of the idea of temperature, and (2) an explanation of other gas laws.

Boyle's Law.—(a) For actual gases. For a given mass of a gas pv is constant if the temperature is constant, no matter how p or v may vary. (b) Compare the law for the theoretical gas as expressed by form (4). For a given mass (M) of a gas pv is constant if v is constant. Thus constant temperature in a single gas means constant v .

Charles's Law.—(a) For a given quantity of any specified gas the product pv increases by equal amounts if the temperature increases by equal steps. (b) Form (5). For a given number of molecules (n) of a specified gas pv increases by equal amounts if mv^2 increases by equal amounts. Thus equal steps of temperature correspond to equal increments of mv^2 or of the average kinetic energy. This leads to the idea of an 'absolute zero of temperature,' when the molecule has no velocity and the gas would exert no pressure on the sides of the vessel. We may indeed define temperature as proportional to the kinetic energy of the molecule, and this would be an absolute scale of temperature, as it would be the same for all perfect gases, no matter what the size of the molecule.

Avogadro's Law.—(a) In equal volumes of different gases at the same pressure there are the same number of molecules if the temperatures are the same. (b) Form (5). Let the gases be denoted by 1 and 2; then we have $p_1v_1 = \frac{1}{3}m_1n_1v_1^2$, and $p_2v_2 = \frac{1}{3}m_2n_2v_2^2$. Hence for equal values of v and of p the values of n are the same if the values of mv^2 are the same. Consequently in different gases at the same temperature the kinetic energies of the molecules are the same. Here this fact has been deduced from Avogadro's law; but it can be proved from mechanical principles; and by reversing the reasoning, Avogadro's may be made to depend on it.

Dalton's Law.—In a mixture of two or more gases the total pressure is equal to the sum of the 'partial pressures' which each constituent would have produced

had it been present alone in the space. This holds only if the attractive force between the different molecules is negligible. If, as already assumed, the total pressure would be the same when, instead of colliding, the molecules pass through each other, this law becomes self-evident. Adopting the above notation, we have $p = p_1 + p_2 = \frac{1}{2}m_1n_1\bar{v}_1^2 + \frac{1}{2}m_2n_2\bar{v}_2^2$; and since the temperatures of the constituents must be the same—i.e. $m_1\bar{v}_1^2 = m_2\bar{v}_2^2$ —this admits of the simplification $p = \frac{1}{2}m\bar{v}^2(n_1 + n_2)$. Thus, if the number of molecules in a space be increased at constant temperature, the pressure increases in proportion to the total number, whether they are similar or not.

When we attempt to account for the discrepancies which occur between the behaviour of the theoretical gas and the behaviour of actual gases, we must take into account assumptions (1) and (2) made in defining the perfect gas. This has been done with considerable success by Van der Waals. (1.) If the molecules are of a non-negligible size, the actual volume moved through by the molecules is less than V by a constant amount b . (2.) If inter-molecular forces are not negligible, then velocity has to account not only for the pressure p on the sides of the vessel, but also for the overcoming of these forces, and this addition can be easily shown to take the form $\frac{a}{v^2}$, where a is a constant. The corrected equation for Charles's law consequently takes the form—

$$\left(p + \frac{a}{v^2}\right)(v - b) = RT.$$

This cubic equation supplies some remarkable results. It gives isothermals for a gas similar to those obtained by Andrews for carbon dioxide, and in the case of liquefaction for a vapour it gives the peculiar theoretical form predicted by James Thomson. Further, it is possible by three observations of the pressure, volume, and temperature of a gas to obtain the constants a , b , and R , and hence to deduce the forms of the isothermals and the critical temperature and pressure, with in many cases a considerable degree of accuracy.

Liquids and Solids.—In order that the kinetic theory may be extended to the explanation of phenomena in liquids and solids, the action of attractive forces between the molecules must be considered. The fact that in the formerly so-called 'permanent' gases, the deductions from the gas laws already described have been so small, shows that attractive forces are to a first approximation negligible. This may be

explained by supposing that the so-called centrifugal effect of great speed counterbalances attractive forces. This supposes comparatively great speeds, and will be altered if these be diminished by cooling the gas, or if attractive forces be made more effective through molecules being brought on the average closer together, as when the density is increased by great pressure. These means, cooling and compression, are the two great agents for the liquefaction of gases.

When a gas or a vapour becomes sufficiently cooled, therefore, molecular attraction becomes more important. Molecules which impinge may remain in contact so that their freedom of motion is greatly curtailed. This is the process of condensation; and the liquid formed is denser, and settles down to the bottom of the enclosing vessel. The process does not go on without limit, but reaches a steady condition of equilibrium. The matter may be illustrated by the analogy of a crowd in an enclosure divided by a straight line into two compartments L and V . Suppose, further, that in the V compartment perfect freedom of motion is allowed, but that in the L compartment the rule prevails that two individuals who come into contact must remain together for one minute before separating. It will be obvious that the chances of a molecule crossing the boundary from V to L is much greater than the chance of a molecule crossing from L to V . Consequently in the L region there will be an accumulation of molecules, greater density, and in the region V a smaller density, the smaller number of molecules compensating for the greater freedom of motion. Cooling the vessel and its contents makes the speed of the molecules less. In the analogy it corresponds to increasing the time from one minute to (say) two minutes. Consequently a smaller density in the V region will suffice to maintain equilibrium—i.e. to get as many molecules across the boundary into the L region as come across from the L region to the V . Hence one can understand in a rough way why to every temperature there corresponds a definite vapour density (and also a definite vapour pressure) so long as some liquid is present.

If there were in the enclosure a number of other neutral individuals incapable of entering the L enclosure, it is obvious that they would not affect the final result. Their presence would not enable a smaller density of V molecules to maintain equilibrium; they would simply impede by their presence the pro-

cess of arriving at equilibrium. This enables us to add to the law expressed at the end of the last paragraph the words, 'even though another neutral gas be present; but the total pressure will be the sum of the pressure of the vapour depending on temperature alone, and the pressure of the gas depending on the temperature and volume according to Charles's law.' This completes the expression of Dalton's law for saturated vapours.

In a liquid a molecule has a certain freedom of translation, and diffusion does take place. Thus, if water be placed over a solution of a salt (preferably coloured, as copper sulphate) in a place where temperature inequalities do not produce convectional disturbances, it will be found that in time the salt will work upwards and the water downwards; but the process takes years to produce an amount of mixture which with two gases would take place in a few seconds. In solids the freedom of translation of the molecule is almost absent. They are settled down to fairly constant positions of equilibrium, in crystals, probably in some simple geometrical groupings, such as is realized by the centres of a pile of cannon balls. They are not in contact, and may vibrate towards and away from one another; and if a molecule be compound, it may have vibrational movements within itself. It may also have rotational energy. That they are not in contact is shown from the fact that a body can be compressed, and that it contracts with cooling. (See ATOM.) That translational energy is not altogether absent in solids is shown by an experiment of Roberts-Austen. He laid a piece of gold leaf on a freshly-cut surface of lead, and after some years the gold had disappeared. By cutting off thin layers of lead and analyzing them he found that the gold had penetrated to the extent of several millimetres. So that diffusion is not altogether absent in solids.

The complete theory of the subject involves the use of the most abstruse mathematics. An elementary treatment will be found in Edser's *Heat for Advanced Students*, ch. xiii. and xiv. (1899), and in the larger text-books of heat, such as Preston's; or of physics, such as those of Watson or Müller-Pouillet; or of physical chemistry, as Walker, Ostwald, or Van 't Hoff. Special books, such as Meyer or Burbury, can only be read by accomplished mathematicians; but an exception is Risteen's *Molecules and Molecular Energy*. A treatment by elementary mathematics is also found in Clerk Maxwell's *Heat*.

Gas or Vapour Density is the specific gravity or relative density of a substance when in the state of gas, the standard of comparison being air or hydrogen, measured under the same conditions of temperature and pressure. Hydrogen is most commonly taken as a standard, as its use permits certain theoretical deductions, pointed out below, to be more easily made than if the comparison is with air.

The methods of determination vary in detail according to the temperature at which the substance in question becomes a gas, but are in principle the same in almost all cases, a given volume of the gas being weighed, or a given weight measured, under known conditions of temperature and pressure. For the sake of uniformity in the calculation, it is assumed that the gas would obey Boyle's and Charles's laws if brought to standard temperature and pressure (0° C. and 760 mm.), and the weight of a litre is calculated under these conditions and compared with the weight of a litre of air (1.293 grams) or of hydrogen (.08985 gram). Thus, if 1.420 c.c. of oxygen at 12° C. and 762 mm. weigh 1.9434 grams, the volume at 0° and 760 mm. would be $1.420 \times \frac{273}{285} \times \frac{762}{760} = 1.360$

c.c., the weight of a litre $\frac{1.9434}{1.360} \times 1000 = 1.420$ grams, and the gas density = $\frac{1.420}{.08985} = 15.88$.

If the gas substance of which the density is to be measured is a gas at ordinary temperatures, Regnault's method, as improved by Rayleigh and others, is employed. An outline of the process is as follows. A large spherical glass flask, of which the capacity is known, is exhausted and counterpoised by a similar flask. The pure gas in question is then allowed to flow in till a definite pressure is reached, being the while immersed in a bath of known temperature, preferably of melting ice. The gain of weight represents the gas added, and from the capacity of the flask, the temperature, and the increase of pressure due to the gas, the density is calculated as above.

If the substance is a solid or liquid at ordinary temperature, the operation is carried out at a temperature sufficiently high to ensure that the substance is completely volatilized. One of the oldest ways of accomplishing this is that invented by Dumas, in which a flask with a fine neck is first weighed full of air, and from the capacity of the flask, the temperature, pressure, and weight of a litre of air, the weight of air in the flask is calculated. Some of

the substance—in quantity several times that sufficient, when in the state of gas, to fill the flask—is put into the flask, which is then immersed in a bath of suitable temperature—*e.g.* of boiling water, mercury, or sulphur, molten fusible metal, lead, etc. The neck only protrudes, and is sealed by the blowpipe as soon as the excess of substance has evaporated off, driving the air before it. The weight of the flask and substance, less the weight of the flask without air, gives the weight of the substances filling the flask at the atmospheric pressure and the temperature of the hot bath, from which the density can be calculated as before.

Another very valuable method is that of Victor Meyer, in which the weighed substance is dropped into a long-necked flask, the bulb of which is immersed in a bath heated well above the boiling point of the substance. The bulb is filled with air, or inert gas, and is provided with a delivery tube, so that the air or gas pushed out by the volatilization of the substance at the bottom of the bulb can be collected in a measuring tube over water or mercury. It thus follows that the volume of this gas represents the volume which the volatilized substance would occupy if it could be brought to the temperature and pressure of the measuring tube without condensation; and hence the gas density can be calculated.

Methods not depending on the weighing of a given volume include the effusion method of Bunsen and the hydrostatic method of Schloesing. In the former the rate at which the gases to be compared escape through a minute hole is measured, when their densities are calculated, as they are proportional to the square of the times of escape of equal volumes; and in the latter a column of the gas is balanced against a column of another gas, such as carbon dioxide, when their densities will be inversely as the heights of the columns. See Travers's *Study of Gases* (1901), and Ostwald's *Physico-Chemical Measurements* (trans. Walker, 1894).

A knowledge of the gas or vapour density of a substance gives very important information as to its molecular structure. Thus, according to Avogadro's hypothesis, equal volumes of gases contain equal numbers of molecules; so the ratio between the weights of equal volumes expresses also the relative weights of the molecules. Now, if the standard of comparison is hydrogen, the gas density of a substance shows therefore how many times its molecule is heavier than the molecule of hydrogen; and if, as we have good reason to be-

lieve, the molecule of hydrogen consists of two atoms, then twice the gas density of a substance is equal to the number of times the molecule of it is heavier than the atom of hydrogen. By virtue of this relation we are enabled to find which multiple of the simple formula of a substance, as found from analysis, should be taken to represent the true formula of the molecule, or to decide whether the molecule has undergone any process of decomposition or dissociation. See DISSOCIATION and MOLECULE.

Gas Manufacture. In 1739 Dr. Clayton, in a paper presented to the Royal Society, described the production of gas from coal heated in an enclosed vessel; but it was not until 1792 that its practical value as an illuminant was demonstrated by William Murdoch, a Scotsman, who used coal gas for lighting his house and office at Redruth in Cornwall. In 1798 he moved his foundry to Soho, London, and also utilized gas for lighting it there. In 1805 Murdoch introduced gas into some cotton mills in Manchester, and in 1810 a London Gas Light and Coke Company was formed.

Coal Gas.—The manufacture of gas consists primarily in the destructive distillation of the coal by heat, causing it to give off its volatile constituents, leaving the solid carbon and ash in the form of coke. These volatile or gaseous constituents have then to be purified, or, in other words, to have those gases or solids removed which might be deleterious to the illuminating power, harmful to health if consumed with the gas, or which may be more valuable when employed for other purposes. The distillation takes place in closed vessels called retorts. These consist of tubes of fireclay, with mouthpieces at one or both ends through which the coal is inserted, and through which, when it is distilled, the coke is removed. They are usually put in sets of from two to ten or fifteen, each set being heated by one furnace to a temperature inside the retort of some $2,010^{\circ}$ F. The heating of the retorts was formerly done by the ordinary open-hearth system of firing, but at the present time in nearly all works the gaseous system of firing has been introduced. In this system the quantity of air that is allowed to enter on the under side of the fuel is only sufficient to form carbon monoxide at the top of the fuel-bed. A further quantity of air, previously warmed by contact with walls heated by the outgoing gases after they have heated the retorts and are on

their way to the flues and chimney, is admitted above the furnace, in what is known as the combustion chamber. The quantity thus admitted is only sufficient to complete the conversion of the fuel into carbon dioxide around the retorts, giving up to them some of the heat, and passing away. The door being closed, the gases from the coal pass by the outlet up ascension pipes, across a bridge-pipe, and down into a hydraulic main. This answers two purposes: it serves for the deposition of the less volatile tars, and also for

sulphur compounds, 1 to 3 per cent. The quantities of the various products from the destructive distillation of coal are: gas, 10,000 cubic feet, or 17 per cent.; tar, 10 gallons, or 5.1 per cent.; virgin ammoniacal liquor, 7.9 per cent.; coke, 70 per cent.

The next process in gas-making is the reduction of the temperature in the hydraulic main from about 150° F. down to the temperature of the atmosphere. This is effected by condensers—usually a series of pipes through which the gas passes slowly, and which are cooled by the surface exposed

wetted surfaces to the gas, which is divided into minute streams, or of bubbling the gas through fine orifices placed slightly below the level of the water or ammoniacal liquor. This is for the purpose of removing the remaining ammonia from the gas. The scrubbers or washers are usually two, the first being fed with weak ammoniacal liquor, which serves to take up a proportion of the hydrogen sulphide (H_2S) and the CO_2 , and so economizes the work in the purifiers later on. The second scrubber is usually supplied with clean water, so as

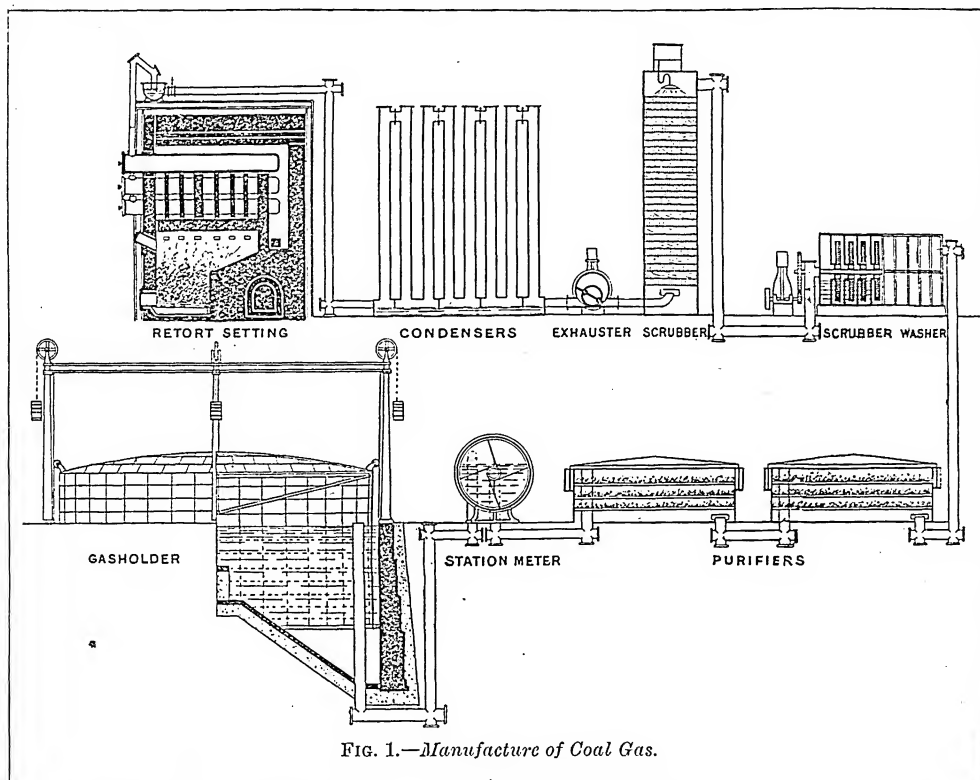


FIG. 1.—Manufacture of Coal Gas.

a seal; so that, when the door of the retort is open, the gases in the hydraulic main cannot escape back. The pressure of the gas above the liquid in the hydraulic main forces the latter to rise up the dip-pipe through which the gas has come from the retort, and thus seal this outlet. The residuals and impurities at the outlets of the retorts, expressed in percentages by weight of the crude gas, are: tar, 33 per cent.; watery vapour, 50 per cent.; ammonia, 2 per cent.; CO_2 , 5 per cent.; H_2S , 2 to 5 per cent.; sulphur, as carbon disulphide and organo-

to the atmosphere. The tar and the virgin ammoniacal liquor are thrown down, the former largely owing to the breaking of the tarry vesicles by friction, and also by the liquefaction of both by the cooling. From the condensers the gas is taken to the exhausters—usually a species of rotary fan or pump which serves to reduce the pressure in the hydraulic mains and condensers, and to force the gas through the rest of the apparatus.

The washing or scrubbing of the gas is the next process, and consists mainly in offering large

to remove all traces of the ammonia, NH_3 . In some works a third scrubber is used here, being supplied with a solution of soda or potash in presence of an iron salt to form crystallized ferro-cyanide of soda or potash by the removal of the cyanogen from the gas. The impurities in the gas after passing the scrubbers will consist of H_2S some 650 grs., CO_2 900 grs., CS_2 40 grs., each per 100 cubic feet, and these have to be removed in the purifiers.

The purifiers usually consist of large rectangular boxes, sufficiently deep to hold several

layers of the purifying material, which is placed upon perforated trays or sieves through which the gas can pass. The covers of the purifiers are usually made with sides, which fit, when lowered into position, into grooves or channels around the purifiers containing water, thus sealing them and preventing the escape of the gas. The purifying material is usually lime (CaO), slaked with water; but it is sometimes used in conjunction with hydrated oxide of iron or Weldon mud (a hydrated oxide of manganese); or the oxide of iron may be used alone, when the percentage of CO_2 is not large. The oxide of iron or manganese will remove the H_2S , but not either of the other impurities, CO_2 or CS_2 . In small works the latter impurity is seldom removed at all; but in larger works the law usually requires that the gas shall not contain more than 17 grains CS_2 in summer, or 22 grains in winter. Usually eight purifiers are employed, worked in pairs, so that one can be opened and the material renewed while the gas is being cleansed by the other. They may all be filled with lime, but more generally the first two are so filled, and these will take up first the H_2S and CO_2 , but the H_2S is afterwards driven off, owing to the greater affinity of the lime for CO_2 . The first pair may thus be said to be used for the elimination of the CO_2 . The next two are usually filled with oxide of iron for the removal of the H_2S ; the third pair with lime, and used for the elimination of the CS_2 . Consequently, when one of the third pair of purifiers has been refilled with lime, it is usual to by-pass the second pair, and let the gas containing the H_2S pass through it to sulphide it, and after this has been done, use it for the removal of the CS_2 , the farther pair of boxes, usually filled with the oxide of iron or manganese, being used to remove the traces of H_2S driven off from the third pair. Frequently, where oxide of iron is used, a small proportion of air or oxygen is employed to convert the H_2S in the oxide into sulphur and water (H_2O), so as to allow the oxide to retain its usefulness for the elimination of H_2S . This it will generally do until it contains some 55 per cent. of sulphur. From time to time, however, the oxide has to be removed from the purifiers and exposed to the oxygen of the air by turning it over and allowing it to have free access to it.

The gas is now completely purified, and, according to Professor V. B. Lewes, consists of hydrogen, 47.9 per cent.; illuminants

of the ethylene series, 3.5 per cent.; of the benzene series, 0.9 per cent.; of the methane series, 7.9 per cent.; methane, 33.3 per cent.; CO , 6 per cent.; CO_2 , 0 per cent.; oxygen, 0.5 per cent.; and N , 0 per cent. It is in this form that it passes to the consumers' burners; so far as the works are concerned, it has only to be measured in the station meter, stored in the gas-holders, and distributed through the governor and mains. The station meter is an enlarged consumer's meter of the wet type, the case sometimes measuring some 20 ft. by 20 ft., by 18 or 20 ft. high, containing within it a cylinder or drum divided into four compartments, each having its own inlet and exit, so arranged that the two are never both above water at the same time.

In the designing and erection of the gas-holder, or gasometer, as it is more commonly but erroneously called, the greatest amount of real engineering has been shown. The gas-holder really consists of a tank in which the holder proper rises and falls, the water in the tank preventing the gas escaping as the holder moves. As the gas is led by the inlet pipe inside the tank and above the water in it, it gradually forces the cylinder out of the water; and the cylinder is prevented from overturning by guide-rollers around its top and bottom edges. The tank must be of the same depth as the holder; otherwise, when the latter is at its lowest, the whole of the gas would not be expelled. To obviate the excavation of a very large amount of earth, a system of telescoping or making the gas-holder in several pieces, each slightly smaller than the other, has been adopted. To prevent the escape of gas between the various pieces, lutes or cups to contain water are provided; and they form concentric grooves, which pick up water from the tank as they rise from it, the next larger cylinder having a corresponding grip or inverted cup fitting into the cup that contains the water. In this way gas-holders with as many as six lifts, and of as large a diameter as from 250 to 300 ft., and 180 ft. high, have been constructed, while the tank has only been some 30 ft. deep.

The pressure of the gas-holder has then to be governed and regulated to that suitable for lighting and heating purposes. The governor consists of a small holder, with a cone hanging from its centre, which serves to close or partially close an aperture in the pipe through which the gas passes according to the height of this holder. The holder is balanced, and weights are put upon it according to the pressure re-

quired on the outlet, and the gas is brought to the under side of the holder from the outlet side of the governor. The weight upon the holder causes it to fall, and lowers the cone with it, thus opening the aperture to allow more gas to pass through until the pressure on the outlet side and under the holder is sufficient to lift it and the weight upon it, when the cone also rises and closes the aperture. When working, the cone quickly assumes the position which allows the right quantity of gas to pass to keep up the pressure, and only changes as more or less gas is required.

The light from gas is commonly attributed to the heating of the very finely divided carbon particles to a white heat by the combustion of the hydrogen, methane, and carbon monoxide in the presence of the oxygen of the atmosphere. There is little doubt that as incandescent burners come more into use, the gas required will be more and more that which supplies heat instead of light, especially as the demand for cooking and heating gas-stoves is so great. This will lead to a lowering of the illuminating power. The illuminating power of gas is always spoken of in terms of sperm candles: the quantity of gas to give the light is always taken at 5 ft. per hour; thus, 16-candle gas is gas which, when burned at the rate of 5 cub. ft. per hour in an Argand burner of certain fixed dimensions, will give a light equal to 16 sperm candles, each consuming 120 grains of sperm per hour.

Oil Gas.—Of the various methods which have been proposed for the use of petroleum oil for gas-making purposes, two are in general use. In the Peebles process, the oil is directly converted into gas in an iron retort at a cherry-red heat, and the gas thereafter washed in oil to remove any non-permanent gas. This makes a gas of some 60 or 70 candle power; and this gas, when used for enrichment, acquires a still further value. The washing by the oil is a great feature, any deposit from that oil being again and again returned to the retort until only permanent gases are made, and the residue converted into coke. In the United Kingdom oil gas is usually made from Scottish shale oil of sp. gr. 0.84 to 0.87, flash-point from 235° F. to 250° F., and yielding about 100 cub. ft. per gallon. In other countries animal and vegetable oils are also successfully distilled to produce oil gas. Oil is, however, used to a greater extent in gas manufacture to carburate water gas, and thus render it suitable for illuminating purposes with flat flame burners. This

process has points that render it suitable in certain situations. Starting with the whole plant quite cold, it can, at a push, be got into thorough working order for the complete manufacture of the gas within some three and a half hours; whereas the quickest time within which coal-gas plant can be brought to anything like working condition is from thirty-five to thirty-six hours.

Water Gas.—Although the reaction of dry steam upon heated fuel was discovered by the French chemist Lavoisier towards the end of the 18th century, it is only within the last twenty-five years that water gas has been made commercially successful. Upon passing superheated or dry steam

In other words, the steam combines with the carbon to form hydrogen and carbon dioxide; this, meeting a further atom of carbon, becomes hydrogen and carbon monoxide.

In the Lowe plant (Fig. 2), coke is placed in the generator *a* and heated up to redness, further heat being obtained by the use of an air blast *b* and steam *c*. The generator consists of a wrought-iron cylinder lined with fire-bricks, closed at the top by a gas-tight door *d*. After the fuel is heated up, the only outlet for the products of combustion is through the carburettor *e* and the superheater *f*, and thence through the flue *g* to the open air. During the passage through these, a large proportion of the heat is given

a cherry red—to the remaining piece of apparatus. All being heated, the air blasts are turned off, and steam is admitted at the generator. This, in passing through the fuel, is separated into CO and H; and they then meet the oil *h*, which is sprayed in at the top of the carburettor in such a way that it covers the area of the top layers of checker bricks, already heated by the passage of the warm gas *k* around the pipes *l* through which the oil finds its way from the tanks. Pumps are used to force it in. The combined gases then pass among the heated bricks, and are there permanently fixed, the superheater providing a lengthy contact, so that the oil is thoroughly cracked and converted into gases. The

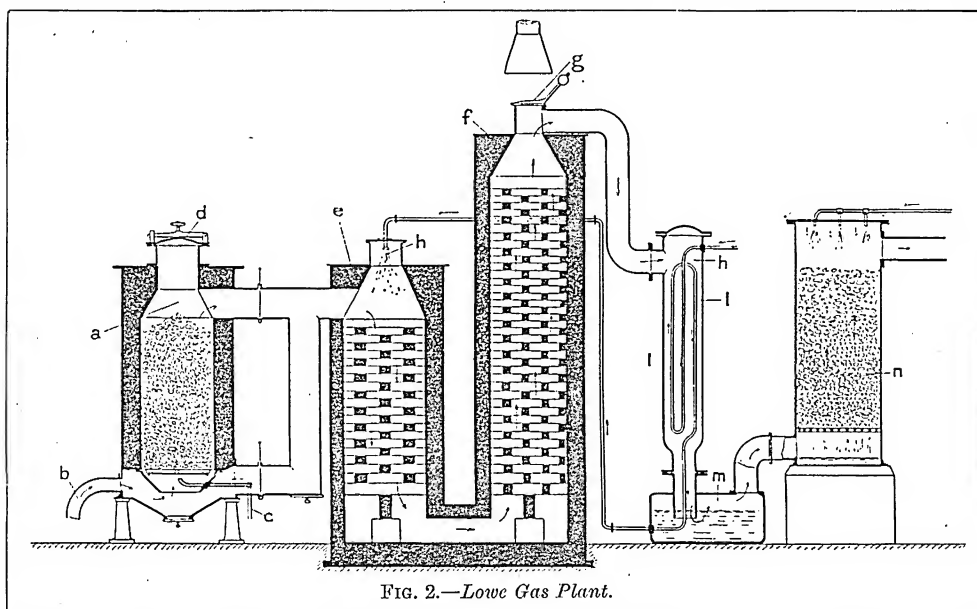
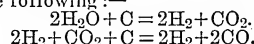


FIG. 2.—Lowe Gas Plant.

through red-hot fuel, the oxygen combines with the carbon, and CO is formed, the hydrogen passing off alone; consequently, water gas is, theoretically, a mixture of CO and H. But these have *per se* no illuminating power, although they are capable of giving out a considerable amount of heat when ignited; so for the purposes of lighting they have to be carburetted, or, in other words, loaded with hydrocarbons, which, carried forward by the diluent gases to the burners, can be made to give up their light where required.

The theoretical manufacture of water gas may be expressed by the following:—



off to the checker brickwork with which they are filled; and when the whole plant is in working order and the blast is in use, only a little more than sufficient air is admitted to the generator to convert the carbon in the fuel into CO, the CO₂ that is formed serving to keep the fuel burning. This CO then passes to the carburettor, when a second quantity of air is forced in by the blast, so that a further portion of the CO is converted into CO₂ in the latter vessel, with the natural evolution of heat among the brickwork. A third portion of air is sent into the superheater to combine with the remaining CO, and thus again form CO₂; so that the gaseous fuel made by the generator is utilized to give the proper heat—

gas next passes through a seal-pot *m*, washers *n*, and condensers, as in the case of coal gas, before being sent through the purifiers to the meters and gas-holders. After from five to seven minutes the passage of the steam through the fuel will reduce the temperature of the latter; it is then shut off, as is also the oil, and the blast again forced into the three vessels for some five minutes. The plant is therefore alternately making gas and heating up again. The producer gas, which is made during the heating-up period, is a combustible gas, and has a heating value of about one-eighth that of 16-candle gas; but the major portion of this heat is utilized for the purpose of heating the carburettor and super-

heater checker-work. Fresh supplies of fuel are required in the generator about every three-quarters of an hour. The following is a fair average analysis of the gas:—

Unsaturated hydrocarbons	10.7 per cent.
CO	31.9 "
Saturated hydrocarbons	16.2 "
H	33.7 "
N	7.5 "

With this process the sulphur compounds do not exceed 10 grains per 100 cubic feet, while the hydrogen sulphide in the crude gas is only about .2 per cent.; the CO₂ in the crude gas equals 3.5 per cent. These two impurities are easily removed by the ordinary process of gas purification.

The oil which is most generally used in Great Britain is Russian solar distillate, which has a specific gravity of about .875, and a

sequently an increase in the hydrocarbons in the gas, which naturally improves the illuminating power. In coal gas, the percentage of marsh gas or methane is from 35 to 40 per cent., with only from 5 to 7 per cent. of CO; while in carburetted water gas the marsh gas is reduced to 20 per cent., and the CO increased to from 25 to 30 per cent. The calorific power of water gas carburetted is perhaps some 10 per cent. less than that of coal gas—say 600 heat-units as against 670—while the size of flame given by it is smaller and of a lower durability than that given by coal gas of an equal quality.

In the Dollwicks water-gas process the air supply is most carefully adjusted, and the level of the incandescent fuel in the generator kept constant. The producer gas is then non-existent, and the products of the blow consist merely of the ordinary

The apparatus required (Fig. 3) is a boiler *a* for generating steam, a generator *b* to be charged with anthracite coal or coke, a hydraulic seal *c*, a coke scrubber *d*, a sawdust scrubber *e*, a gas-holder for storage, and governing gear *f* to stop the making of gas when the holder is full. The composition of the gas may be taken as:—

	By volume.
Carbon dioxide (CO ₂)	6.3 per cent.
Carbon monoxide (CO)	23.8 "
Marsh gas (CH ₄)	1.3 "
Hydrogen (H ₂)	19.8 "
Nitrogen (N ₂)	48.8 "
	100.0 "

In this plant 1 lb. of anthracite will produce 80.9 cub. ft. of gas of 164 heat-units per cub. ft. To this must be added 0.18 lb. coke required in the boiler. The cost may be taken as from 2d. to 3d. per 1,000 cub. ft. The efficiency

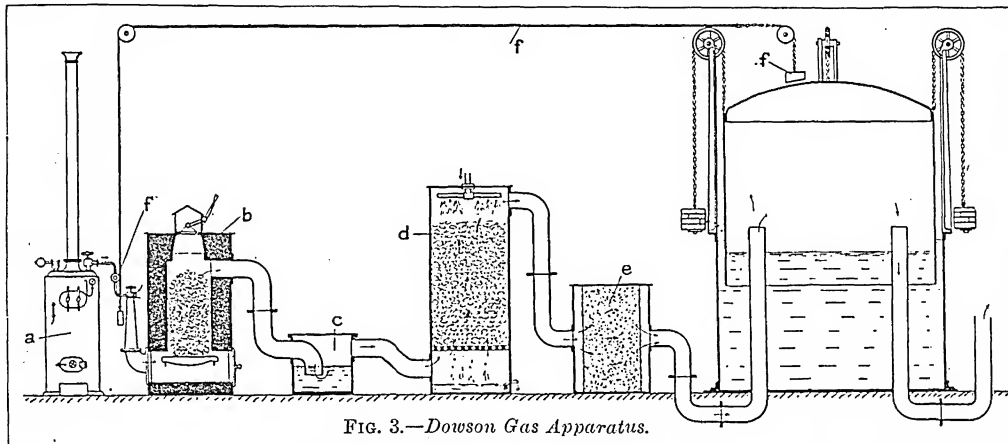


FIG. 3.—Dowson Gas Apparatus.

flash-point of from 170° to 200° F. To manufacture 1,000 cub. ft. of gas, about 45 lbs. of fuel are required, while some 5.46 lbs. of oil will be needed to make a gas of about 25-candle power.

For the purpose of obtaining an air blast in the generator—which is required to be of a pressure of from twelve to fifteen inches of water—centrifugal fans or blowers are used, worked by steam-engines running at about 2,000 revolutions per minute. When the mixing of rich gases is made with poor ones, as is often done in England, where 16-candle gas is supplied and water gas is made, the mixing should be done as early in the process of manufacture as possible. The making of gas of any required candle power is a very simple matter; the mere opening of a valve causes an increase in the quantity of oil injected, and con-

non-combustible products of complete combustion—carbon dioxide and nitrogen—the result being that double the quantity of water gas can be made per pound of fuel, and the extra heat generated minimizes the period of blowing, and enables runs or times of steaming to be longer. There is a very low percentage of CO₂ in this gas, owing to the careful regulation of the steam into small quantities.

Dowson Gas, named after Mr. J. Emerson Dowson, is practically producer gas and water gas mixed, and is made by passing superheated steam and air through a mass of incandescent fuel: the steam is decomposed, while the air supports combustion. The air which has been passed through to support the combustion of the fuel and make the process continuous, causes the formation of a certain quantity of CO₂ and N,

of the plant works out at about 77.6 per cent. of the total heat of the fuel used.

Mond Gas (Fig. 4).—This is also a system of water gas, a modification of the preceding, in which large quantities of superheated steam are introduced into the producer, whereby the ammonia in it is not decomposed. The heat of the gases made serves to dry the steam and warm the air; the gas passes through a washer, and then to an acid tower, where the liquor contains 4 per cent. of pure acid; finally the gas goes to the gas-holder and mains. One ton of fuel in the producer requires 2½ tons steam and 3 tons air to be blown in. Four and a half tons of gas are made from 1 ton of coal, or about 160,000 cub. ft., at the same time that 1 ton of sulphate of ammonia is made from 23 tons of coal gasified. Adding 5.56 tons for the

extra steam needed, 28·56 tons of coal produce 1 ton of sulphate of ammonia. Composition of Mond gas:—

H ₂	24·8	per cent.
CH ₄	2·3	„
CO	13·2	„
CO ₂	12·9	„
N ₂	46·8	„
	100·0	„

Calorific value, 154·6 B.T. units per cub. ft. Combustible gases, 40·3.

Acetylene Gas is made from calcium carbide (CaC₂), which is the result of the fusing together of lime and coal or coke dust in an electric furnace. On bringing water into contact with it, it at once decomposes, the hydrogen

rate at ordinary temperatures, and form a gas somewhat heavier than air. The apparatus required is a box, with one orifice at top and another at bottom, partially filled with a porous material, which is saturated as required with the refined petroleum. When the two orifices are opened, air enters at the top orifice, and, becoming charged with hydrocarbon vapour from the petroleum, is rendered heavier, and passes out from the bottom orifice in the form of gas to the burner. The box containing the petroleum must be placed some few feet above the burner. An Argand burner is generally used, and, if required, an incandescent mantle may also be employed, but it

H. O'Connor (1898); *Modern Methods of Saving Labour in Gasworks*, by C. E. Brackenbury (1901); and *Handbook of Practical Gasfitting*, by Walter Grafton (1901).

Gascoigne, GEORGE (c. 1525-77), English poet and dramatist, was born at Cardington, Beds. In 1566 he took part in plays at Gray's Inn, translating Ariosto's *Gli Suppositi*, and helping in *Jocasta*, an adaptation of the *Phænissæ* of Euripides. Gascoigne superintended Leicester's entertainment of Elizabeth at Kenilworth. His works include *A Hundred Sundry Flowers* (1572), enlarged as *Posies* (1575); *A Glasse of Government* (1575); *The Steele Glas* (1576); *The Com-*

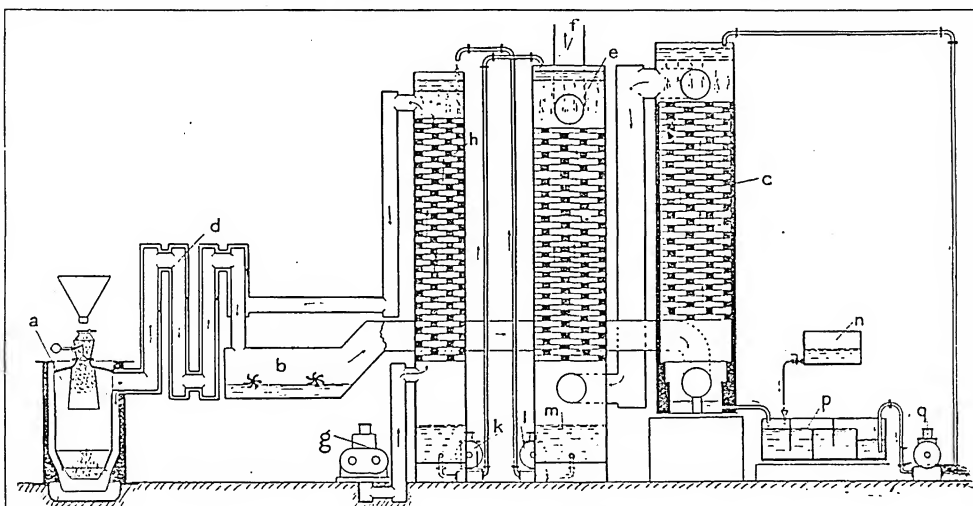
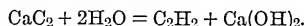


FIG. 4.—Mond Gas Plant.

Coal slack enters producer *a* and while in the bell-mouth of the hopper, the products of distillation escape, as shown by the arrows, to the regenerator *d*, and thence through the washer *b* to the acid tower *e*, and finally through *f* to the gas-holder. A blower *g* forces air up the air-heating tower *h*, where it meets a stream of hot water drawn from the bottom of the cooling tower *e* by pump *i*: the water falls into tank *m*, and is sent by pump *k* to the top of the cooling tower *e*. The air, charged with steam, passes from tower *h* through the jacket of the regenerator *d*, and is delivered superheated at the bottom of the producer *a*; *n* is an acid tank, *p* an acid settling tank, and *q* a pump which returns the clear acid to the top of tower *e* after the sulphate has settled in tank *p*.

combining with the carbon to form the rich hydrocarbon gas known as acetylene, the residuum being slaked lime—



One pound of calcium carbide will make 5 cub. ft. of acetylene gas of an illuminating value of 250 candles per 5 cub. ft. per hour. For power purposes, 6·35 cub. ft. of acetylene give 1 H.P. At 22 atmospheres the gas is condensed into a colourless mobile liquid lighter than water. As an enricher of lower quality gases it does not show the same illuminating value as when burned alone.

Nolkin Gas is the product of the evaporation of the lighter petroleum of 0·65 or lower density. These petroleum vapours

should have a longer chimney than usual, to produce a rush of air which will render the flame atmospheric. The gas may be used for heating or power; in the latter case it will require 1·199 lbs. of petroleum per 1 H.P. See *Handbook for Gas Engineers and Managers*, by Thomas Newbigging (1883); *The Chemistry of Gas Manufacture*, by W. J. Atkinson Butterfield (1898); *Gas Lighting*, by Charles Hunt (1889); *Gas Manufacture*, by John Hornby (1896); *Practical Photometry: a Guide to the Study of the Measurement of Light*, by W. J. Dibdin (1889); *Gas Analysis*, by John Hornby (1894); *Construction and Working of Regenerator Furnaces*, by Maurice Graham (1894); *Gas Engineer's Pocket-book*, by

playnte of Phylomene (1576); *Princely Pleasures at the Court of Kenilworth* (1576). See *Collected Works* (1587); ed. W. C. Hazlitt (1868-9). See *Schiller's Life* (1893).

Gascony, former prov. (duchy) of France, comprising most of the country s. of the Garonne; derives its name (Lat. *Vasconia*) from the Basques or Vasques.

Gaskell, ELIZABETH CLEGHORN (1810-65), English novelist, born at Chelsea. Her youth was passed at Knutsford, Cheshire (immortalized in *Cranford*). In 1832 she married William Gaskell, a Unitarian minister of Manchester. *Mary Barton* (1848), a novel of factory life, made her famous. *Cranford* (in *Household Words*, 1851-3) was

a series of exquisite studies of village life. Then followed *Ruth* (1853); *North and South* (1854); *Lizzie Leigh* (1855); *Life of Charlotte Brontë* (1857), which caused much controversy; *My Lady Ludlow* (1859); *Sylvia's Lovers* (1863); *Cousin Phillis* (1865). Her *Collected Works* first appeared in 1873, and again (The Knutsford edition in 8 vols.) in 1906-7.

Gas Liquor is the watery solution produced by washing and condensing the products of the distillation of coal in the preparation of coal gas. It is an unpleasant-smelling liquid, of which free ammonia and ammonium salts, notably the sulphides and carbonates, are the chief and most valuable components. Gas liquor forms our chief source of ammonia, which is separated from it by distillation, either alone or with lime, and converted into ammonium sulphate by solution in sulphuric acid.

Gasolene. See PETROLEUM.

Gasometer. See GAS MANUFACTURE.

Gasparin, AGÉNOR, COMTE DE (1810-71), French politician, born at Orange; held a position in the ministry of the interior and the ministry of agriculture and commerce. Elected deputy for Bastia, Corsica, in 1842, he became a vigorous opponent of slavery and every form of religious intolerance, especially as shown towards his Protestant co-religionists. In 1846 he discarded politics for the pen. See *Life* by Borel (1878). —His wife, **VALÉRIE BOISSIER** (1813-94), born at Geneva, shared her husband's enthusiasm for religious freedom and the reformed religion. Her *Le Mariage au Point de Vue chrétien* (1843) received the Montyon prize of the French Academy. It appeared in abbreviated English adaptation as *The Four Homes* (1861). She also wrote a popular criticism of General Booth and the Salvation Army, entitled *Lisez et Jugez* (1883; Eng. trans. 1883), and *Les Horizons prochains et les Horizons célestes* (1859; Eng. trans. 1861). See Dutoit's *La Comtesse A. de Gasparin* (1901).

Gaspé, or GASPÉ BASIN, a fishing centre and summer resort in Gaspé peninsula, prov. Quebec, Canada, is the place where Jacques Cartier first landed in Canada, July 24, 1534. Pop. of tn. (1901) 454.

Gasquet, FRANCIS AIDAN (1846), abbot of the English Benedictines, was born in London. He was superior of the Benedictine college and monastery at Downside in Somersetshire. He occupies a distinguished place as a Roman Catholic historian, and has written *Henry VIII. and the English Monasteries* (1888-9);

Edward VI. and the Book of Common Prayer (1890); *The Last Abbot of Glastonbury* (1895); *A Sketch of Monastic Constitutional History* (1896); *The Eve of the Reformation* (1900); *Henry III. and the Church* (1905); *English Monastic Life* (1904); *Life of Pope Gregory the Great* (1904); and has edited Montalembert's *Monks of the West* (6 vols. 1896) and *The Letters of St. Bernard* (1904).

Gassendi, PIERRE (1592-1655), whose proper name was Gassend, French philosopher, was a native of Provence; settled at Digne in 1612 as lecturer in theology. Shortly after 1617 he became professor of philosophy at Aix, where he wrote the first part of his *Exercitationes Paradoxicæ adversus Aristoteleos*, a revolt against the Aristotelian philosophy. He was in 1645 appointed to the professorship of mathematics at the Collège Royal de Paris. Gassendi was a philosophical critic rather than an original thinker. In his *Syntagma Philosophiæ Epicuri* is sketched a philosophical system based upon that of Epicurus. To physical science he rendered good service by his insistence on the value of observation and experiment. His *Collected Works* were published in 1658 and 1727. See Bernier's *Abrégé de la Philosophie de Gassendi* (1678), Thomas's *La Philosophie de Gassendi* (1889), and A. Martin's *Histoire de la Vie et les Ecrits de P. Gassendi* (1853).

Gassner, JOHANN JOSEPH (1727-79), Austrian exorcist, born near Bludenz (Vorarlberg); pretended to heal the sick by exorcism, until his imposture was discovered, and his practices checked, by Joseph II. (1777), who compelled him to leave Ratisbon, which had become the centre of his activity. See *J. J. Gassner*, by Zimmermann (1878).

Gastein, Alpine valley in the Austrian province of Salzburg, penetrates the N. face of the Hohe-Tauern, and is famous for its mineral springs, chiefly at Wildbad-Gastein, 16 m. from the entrance of the valley. Gastein was a favourite resort of the Emperor William I. of Prussia, and of Bismarck. Pop. (1900) of entire valley, 4,436.

Gaster, MOSES (1856), Roumanian philologist and Hebrew scholar, born at Bucharest; was lecturer at the University of Bucharest from 1881-5, but was expelled from the country for agitating on behalf of the Jews. Proceeding to England, he was in 1886 appointed Ilchester lecturer at Oxford, and since 1887 has been chief rabbi (Haham) of the Sephardi communities in England. He is one of the pioneers and leaders of the Zionist movement.

Among his numerous works are *Literatură Populară Română* (1883), and *Chrestomathie Roumaine* (2 vols. 1891), both standard works; further, 'Geschichte der rumänischen Literatur,' in Gröber's *Grundriss der romanischen Philologie* (1899), in which he breaks new ground; in English, *Greco-Slavonic Literature* (1887).

Gasteria, a genus of small, evergreen, succulent plants belonging to the order Liliaceæ. They are natives of the Cape, but are grown under glass in Britain, flowering in winter. They have long, thick, fleshy leaves, and bear their flowers in panicles or racemes.

Gasteropoda. See GASTROPODA.

Gaston de Foix. See FOIX FAMILY.

Gastrectomy is an operation for the partial or complete removal of the stomach. It is only of recent years that it has been attempted. The only condition that justifies even the consideration of such a serious operation is cancer of the stomach, and those cases alone are suitable in which the disease is at an early stage, and the patient's strength is still unimpaired. The operation was performed successfully for the first time by Schlatter. See *Medical Annual* for 1900.

Gastric Catarrh, or inflammation of the lining membrane of the stomach, may be acute or chronic, and may depend upon constitutional causes such as gout, or upon local irritation by the ingestion of unsuitable food or spirituous liquors. The condition is associated with congestion of the vessels of the mucous membrane and with increased secretion of mucus. The leading symptoms are pain and vomiting, which are exaggerated by the introduction of food. Treatment consists in giving the stomach the utmost possible rest. Only small quantities of simple food, such as iced milk, should be administered, with bismuth and other sedatives. Counter-irritation may also be employed over the region of the stomach, and constitutional causes must be combated.

Gastric Colic. Colic originally signified pain arising from intestinal spasm, but the term is no longer restricted to bowel affections, and renal, hepatic, and gastric colics are recognized. Spasm of the stomach is frequent in atonic dyspepsia, and the pain usually results from the organ becoming over-distended with gas, which it has been unable to expel on account of spasmodic contraction of the cardiac orifice. Great relief is generally obtained from a mixture containing a little essential oil, such as peppermint or cinnamon, in chloroform water.

In more obstinate cases hot fomentations are of service.

Gastric Juice is the secretion from the cells in the mucous membrane of the stomach, and is acid in reaction. It also contains the ferment pepsin and two other ferments, rennin, and a lactic acid ferment. It is stimulated by pleasant, and retarded or stopped by unpleasant, sensations. The entrance of food and alkaline saliva into the stomach excites a free flow of gastric juice, although some articles of diet—notably tea, coffee, vinegar, and spirits—check the secretion. Its chief action is upon the albuminates or proteids, which are changed into soluble peptones by the ferment pepsin. See DIGESTION, DIET, STOMACH.

Gastrochæna, a genus of burrowing lamellibranchs, with gaping shells, which are of very thin texture. In Britain there occurs *G. modiolina*, which burrows in limestone.

Gastrobium, a genus of W. Australian evergreen shrubs, belonging to the order Leguminosæ. They require greenhouse temperature in Britain, but their racemes of yellow flowers and coriaceous evergreen leaves make some of the species worthy of cultivation as ornamental plants.

Gastropoda, or **GASTEROPODA**, are molluscs in which the body is more or less markedly unsymmetrical. The head is well developed, usually bears horns and eyes, and contains a radula or tooth-ribbon within the mouth cavity. The foot is typically a flat, creeping surface. Head and foot show no want of symmetry, but the visceral hump is twisted to the right side, where usually lie the posterior opening of the food-canal and the openings of ureter and genital ducts. The same want of symmetry is shown internally in the presence usually of only one gill, one nephridium or kidney, one auricle in the heart. A shell may be present or absent; when present it is frequently coiled in a spiral. A comparison of garden snails and slugs shows, however, that the presence or absence of a shell is not a matter of much systematic importance, snails and slugs being obviously nearly related. One classification of gastropods is as follows:—

Order 1. *Prosobranchiata*.—A shell is almost always present; the usually single gill lies in front of the heart; the sexes are separate.

(a) *Diotocardia* (heart with two auricles), primitive forms, including the limpets, the ear-shell (*Helix*), tops (*Trochus*), and so on.

(b) *Monotocardia* (heart with one auricle), most of the familiar marine forms, such as whelks,

periwinkles, dog-whelks, and so on, together with the pelagic heteropods.

Order 2. *Pulmonata*.—The air-breathing snails and slugs, without gills; sexes united. Some, like the garden snails and slugs, are terrestrial; others are freshwater forms. The shell is present or absent.

Order 3. *Opisthobranchiata*.—In opposition to the prosobranchs, the gill, if present, is behind the heart; the shell is often absent.

(a) *Tectibranchiata* (gills concealed). A shell is present, though it may be very small and concealed; there is a mantle fold, beneath which lies the gill.

(b) *Nudibranchiata* (gills exposed), sea-slugs in which there is no shell, no mantle, no true gill, but often gill plumes formed by outgrowths of the body wall, which are exposed.

Gastrotomy is the operation of opening into the stomach by cutting the body and stomach walls, in order to ascertain the nature or extent of disease.

Gastrula, the name applied by Haeckel to a thimble-shaped larva which appears in the life history of many different kinds of organisms. Such a larva, as it occurs in, for example, an annelid, or in the simple vertebrate amphioxus, consists of an outer layer of cells, or ectoderm, and an inner or endoderm. The inner layer lines the gastral cavity, which communicates with the interior by an opening called the blastopore. The gastrula itself arises from a blastosphere, or hollow ball of cells, by the folding in of the cells at one point, as a thimble might be made by pushing in one side of a hollow ball. The outer and inner layers of cells of the gastrula always give rise to definite organs of the future animal. (See EMBRYOLOGY.) Haeckel believes that all many-celled organisms have arisen from a gastrula-like ancestor.

Gata, SIERRA DE. See GUADAR-AMAS.

Gatacre, SIR WILLIAM FORBES (1843-1906), English general, first saw active service in the Hazara, or Black Mountain expedition on the north-west frontier of India, in 1888. He then went through the Burmese campaign of 1889-90. Five years later he was again on the north-west frontier, serving with the force which, under Sir Robert Low, relieved Dr. (now Sir George) Robertson at Chitral. Gatacre was present at Mamugai, and at the storming of the Janbatai and Lowari passes. He left India in 1897, and proceeded to the Sudan, where he took command of the British brigade which did such excellent service at the battles of Atbara and Omdurman. On the outbreak of the South

African war Sir W. F. Gatacre was given the command of the 3rd Infantry Division in October 1899. Soon afterward he met with a severe reverse at Stormberg (Dec. 10). He failed to render assistance to troops at Reddersburg, who were captured by the Boers (April 4, 1900), and was recalled. After his return home he received command of the Eastern District.

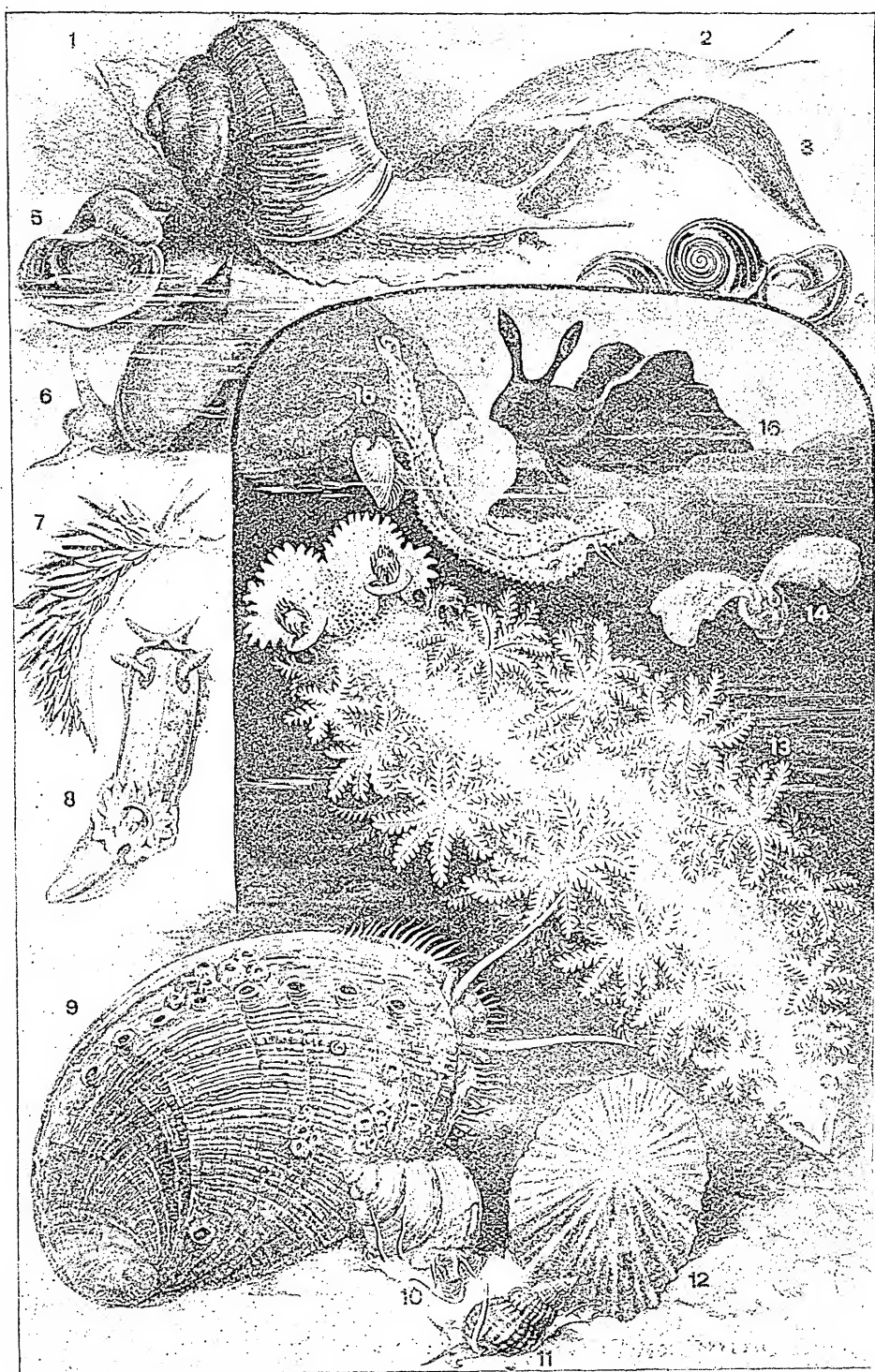
Gataker, THOMAS (1574-1654), English Puritan divine, born in London, in 1611 was appointed rector of Rotherhithe. In 1643 he was chosen member of the Westminster Assembly, in which he discountenanced the Covenant, and advocated episcopacy. His chief works are *On the Nature and Use of Lots* (1619), an edition of *Marcus Antoninus* (1645), and *Cinnus sive Adversaria Miscellanea* (1651).

Gatchina, or GATSKHINA, tn., Russia, 28 m. s. of St. Petersburg. It contains one of the imperial residences. Pop. (1897) 14,735.

Gate and GATEWAY. In mediæval military architecture the gate was a ponderous barrier swung on massive hinges within an arched 'gateway' of considerable depth. A body of men attempting to batter down the gate found themselves exposed to a rain of missiles from the perforated ceiling, and from the flanking towers which commanded the gate. And if the outer barrier of solid oak were hewn in pieces, the assailants found themselves before a portcullis or grating, which dropped from the roof and formed a second barrier, through the interstices in which missiles were launched and weapons thrust at the foe.

Gates, HORATIO (1728-1806), American general, was born at Maldon in Essex, England. He served under Braddock against the French colonists on the Ohio in 1755. In 1775 he joined the American army as adjutant-general. In 1776 he compelled the surrender of General Burgoyne's army at Saratoga, but suffered (1780) a severe defeat at Camden, S. Carolina, and was replaced by General Greene.

Gateshead, parl., munic., and co. bor. and seapt. in Durham, England, on the S. side of the Tyne, opposite Newcastle, and on the N.E.R., 14 m. N. of Durham. The church of St. Mary is a handsome cruciform structure assigned to the 12th century, but it has been almost entirely rebuilt, the earlier edifice having been burned in 1854. Trinity Chapel, formerly St. Edmund's, is believed to occupy the site of an ancient monastery. Among the public buildings are the town hall, public library, and hospitals. There is also a public park (Saltwell, 52 ac.). The hydraulic swing bridge, opened in



Types of Gastropoda.

1. *Helix pomatia*. 2. *Limax flavus*. 3. *Arioh hortensis*. 4. *Helix hortensis*. 5. *Limnaea auricularia*. 6. *Limnaea stagnalis*. 7. Three coloured Æolis. 8. Angled doris. 9. Ear shell. 10. Common top. 11. Netted dog whelk. 12. Limpet. 13. Triton Hombergi. 14. *Spiralis Fleutngii*. 15. Mediterranean *Carinaria*. 16. Sea-hare. (Order 1 (a), Nos. 9, 10, 12; order 1 (b), Nos. 11, 15; order 2, Nos. 1, 2, 3, 4, 5, 6; order 3 (a), Nos. 14, 16; order 3 (b), Nos. 7, 8, 13.)

1876, occupies the site of a Roman bridge. The manufacture of locomotives, anchors, chain cables, etc., is largely carried on. The N.E.R. Company has workshops here, employing 2,000 persons; and there are chemical and glass works. Grindstone is quarried, and coal is mined. It returns one member to the House of Commons. Pop. (1901) 109,888.

Gath, one of the five royal cities of the Philistines, on the border of Judah; was the birthplace of Goliath (1 Sam. 17:4). Fortified in 1144, it was taken by Saladin forty-seven years later, and recaptured by Richard I. of England in the next year.

Gatling, RICHARD JORDAN (1818-1903), the inventor of the machine gun known by his name, born in Hertford co., N. Carolina, U.S.A. He invented several machines for sowing seeds, and also a steam-plough, before turning his attention to firearms. His gun was patented in 1861, was used in the American civil war, and was greatly improved in 1865. Its special feature was that from a cluster of six or ten rifle barrels secured to a revolving axis there was discharged, simply by turning a handle, a shower of bullets upon any given object.

Gatschina. See GATCHINA.

Gau. See GA.

Gau, FRANZ CHRISTIAN (1790-1853), German traveller and architect, was born at Cologne. After two years of travel in Palestine, Egypt, and Nubia, he published his *Antiquités de la Nubie* (1824), and the same year the last two volumes of Mazois's *Ruines de Pompéii*. In 1826 Gau became a naturalized Frenchman, and was appointed imperial architect, and restored, in whole or in part, the churches of St. Julien le Pauvre, St. Séverin, and Ste. Clotilde, in Paris. From 1824-48 he was director of the School of Architecture in Paris.

Gauchos, the Hispano-American inhabitants of the pampas of Argentina. They have but a slight strain of Indian blood. They are the 'centaurs' of the pampas, often sleeping for hours in the saddle, while their mounts make instinctively for the nearest watering-places. Their skill in the use of the lasso is extraordinary, and has been acquired in tending the half-wild herds. Their politeness and hospitality are proverbial. But observers looking below the surface speak of their sordid nature, cruel treatment of their women, reckless gambling, licentious lives, and fanaticism without a spark of true religion. See Darwin's *Voyage of the 'Beagle'*, and Keane's *Man, Past and Present*.

Gaudcamus, German students' song, so called from the first

word of the first line, which runs — '*Gaudcamus iquitur, juvenes dum sumus*' ('Let us therefore rejoice while we are young'). The whole is in dog-Latin, and is of considerable antiquity.

Gaudichaudia, a genus of tropical shrubs belonging to the order Malpighiaceæ. They bear yellow flowers, many without petals, and are mostly climbing or twining plants. They like a fairly moist soil containing a good proportion of peat.

Gaugamela, vil. of Assyria, a few miles east of Nineveh (and the modern Mosul), near which, in 331 B.C., Alexander the Great routed the Persian host under Darius. The battle is often known as that of Arbela, a place 40 m. farther to the east.

Gauge, the width of a railway track, measured from inside to inside of the heads of the rails. Round sharp curves this dimension is increased to the extent of half an inch at most. The standard gauge of any country is that adopted by the majority of its railways. The standard gauges of the principal countries of the world are: 3' 3½" (1 metre), India, Brazil, and Uganda; 3' 6", Queensland, Tasmania, the Cape colonies, Egypt (Sudan), and Japan; 4' 8½", Great Britain, and most of Europe, Canada, the United States, N. S. Wales, Egypt, Uruguay, and Peru; 5' 0", Russia; 5' 3", Ireland, Victoria, S. Australia, and New Zealand; 5' 6", India, Spain, Portugal, the Argentine Republic, Brazil, and Chile. The gauge of tramways is usually 4' 8½".

Gauge, STEAM-GAUGE, etc. See STEAM-GAUGE, etc.

Gauhati, or GOWHATTY, tn. in Kamrup dist., Assam, India, on the Brahmaputra. Pop. (1901) 11,661.

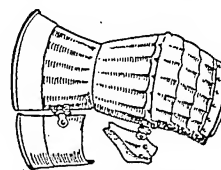
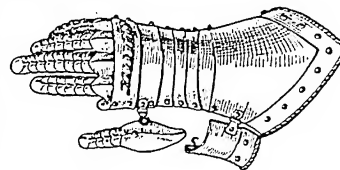
Gaul. See FRANCE.

Gault, a stiff bluish or grayish clay which lies between the Lower and Upper Greensand divisions of the Cretaceous system. It is often richly fossiliferous, as at Folkestone in England. The Gault is best developed in the east and south-east of England, where it mostly forms a low valley at the base of the escarpment of the White Chalk. It forms a stiff clay land, and is very retentive of water. It is largely used for making bricks and tiles. At Folkestone, Portland cement is made from Gault clay mixed with chalk. The fine argillaceous material of which it is composed indicates that it was laid down in comparatively deep water, though not at such depths as the pure White Chalk which overlies it. Among its characteristic fossils are ammonites.

Gautheria, a genus of American shrubs belonging to the order

Ericaceæ. They are mostly tender in Britain, requiring greenhouse treatment; but *G. procumbens*, the creeping winter-green, is hardy, bearing its white flowers in summer, followed by edible red berries in autumn. *G. shalton* is also hardy, and its berries are also edible.

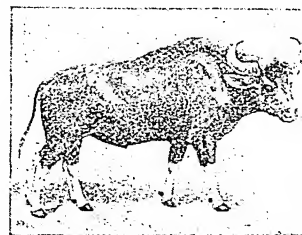
Gaunt, JOHN OF. See JOHN OF GAUNT.



Gauntlet and 'Mitten.'

Gauntlet, the protective armour of the hand, dates from the 12th century. The first gauntlets—leather-covered gloves, with an unarticulated metal back—were evolved from the chain-mail bag which, in the 12th century, terminated the sleeves of the hauberk. The gauntlet of the 14th century, with separate but unjointed fingers, was superseded by the 15th-century 'mitten' of jointed plates of steel, not separated for the fingers.

Gauntlett, HENRY JOHN (1805-76), English musical composer, born at Wellington, Shropshire; was organist in various London churches, and from 1846 until his death held a leading place among English musical critics. The *Encyclopædia of the Chant*, though not published until 1885, was in great part the work of Gauntlett. He is best known for his hymn tunes and chants, and for his improvement of English organs.



Gaur.

Gaur (*Bos gaurus*), or Indian bison, is distributed throughout the forest regions of India and Burma, and has never been domesticated,

except to a very limited extent by certain hill tribes. The colour is dark, almost black, and there is a high convex ridge on the forehead between the horns, which are strongly flattened at the base. A full-grown bull may stand six feet at the withers, but owing to the slope of the back, the loins are much lower. There is no dewlap, and the ears are large. The gaur is found in large herds, and is exceedingly shy.

Gaur, or **LAKHNAUTI**, ruined city of Bengal, India, on the Bhagerathi, a deserted arm of the Ganges. It was the capital of the Mohammedan viceroys and some of the kings of Bengal from the 12th century.

Gaura, a genus of hardy annual and perennial herbaceous N. American plants belonging to the order Onagraceae. The flowers are borne successively in slender terminal racemes. The best species is the white and pink *G. Lindheimeri*, from Texas, which is easily grown from seed in light soil in a warm situation.

Gauss, **KARL FRIEDRICH** (1777-1855), German mathematician, born at Brunswick; won an early reputation by his *Disquisitiones Arithmeticae* (1801). From 1807 until his death he held the directorship of the Göttingen observatory, and in 1809 his astronomical studies resulted in the valuable *Theoria Motus Corporum Caelestium*. In 1833 Gauss erected, in conjunction with Weber, a magnetic observatory at Göttingen, and a Magnetic Association was set on foot. They published a series of volumes (1836-9) entitled *Resultate aus der Beobachtungen des Magnetischen Vereins*, those for 1838-9 containing valuable memoirs by Gauss. He conducted the trigonometrical survey of the kingdom of Hanover, and published two memoirs, *Ueber Gegenstände der höhern Geodäsie* (1843 and 1846). Studies in applied mathematics in relation to light appeared in his *Dioptrische Untersuchungen* (1840). His collected works, edited by E. J. Schöring, appeared at Göttingen (1863-74; 2nd ed. 8 vols. 1870-1900). See also *Lives*, in German, by Waltershausen (1856), Hänselmann (1878), and Schering (1887).

Gaussen, **FRANÇOIS SAMUEL ROBERT LOUIS** (1790-1863), Swiss theological writer, born at Geneva. After his association with Merle d'Aubigné in the establishment of the Société Évangélique, which included among its aims the teaching of the old Calvinistic theology, Gaussen was removed from his charge at Satigny, near Geneva, in 1832 by the state council. In 1836 he became a lecturer in the new theological school. His *La Théopneustie, ou Pleine In-*

spiration des Saintes Ecritures (1840; new Eng. trans. 1888) gained considerable popularity, and his *Le Canon des Saintes Ecritures au Double Point de Vue de la Science et de la Foi* (1860; Eng. trans. 1862) is still reckoned a standard work by the older school of Biblical scholars.

Gauss's Theorem. See **ELECTROSTATICS**.

Gautama. See **BUDDHA**.

Gautier, **THÉOPHILE** (1811-72), poet, and one of the most influential French prose writers of the middle of the 19th century, was born at Tarbes. As a man of letters, he possessed an ear for rhythm unequalled in its kind, together with a fervent and romantic fancy. Gautier threw himself eagerly into the war of the romanticists against the classicists, and was conspicuous on the nights of the celebrated 'battle of Hernani' in 1830. (See **HUGO, VICTOR**.) Théophile made his début with a volume of verse in this same year (1830). Three years later followed another volume, *Albertus*, which is bolder and more original, although it never rises to the height of fine poetry. His prose work, *Mademoiselle de Maupin*, published in 1835, caused no small scandal at the time, because of its appeal to the lubricity of its readers. But it has immense charm of style, and in passages rises to an eloquence which has much that is akin to the prose of De Quincey. Balzac greatly admired *Mademoiselle de Maupin*, and engaged its author on a journal (*Le Chronique de Paris*) which he was editing. In 1838 Gautier wrote his *Comédie de la Mort*, which marks a break with his first romantic epoch. Soon after this he began his series of travel-pictures, which extend from 1845 to 1866, and describe various parts of France, Italy, Spain, Russia, and Turkey (Constantinople). During the same period Gautier was writing a series of archaeological works, of which *Le Roman de la Momie* is the best known. His *Une Larme du Diable* (1839) has a certain resemblance in spirit to *Albertus*. *Le Capitaine Pracasse* (1863), a sort of aftermath of the romantic spirit, tending more towards irony and towards the fantastic than the earlier books. In the judgment of many this is the best of Gautier's prose works. It may owe some of its inspiration to Goethe's *Wilhelm Meister*. Gautier died at Neuilly, near Paris. The following list includes only some of his principal productions. Poems—*La Comédie de la Mort* (1838); *Les Intérieurs et les Paysages* (1845); *Émaux et Camées* (1852). Novels, stories, etc.—*Une nuit de Cléo-*

patre (1836); *Le Roi Candarles* (1847); *Mililona* (1848); *Les Roués Innocents* (1849); *Jean et Jeanette* (1850); *Partie Carrée* (1851); *Arria Marcella* (1852); *Jettatura* (1857); *Avatar* (1857); *La Belle Jenny* (1864); *La Peau de Tigre* (1852); *Spirite* (1855); *Les Jeunes France* (1867). To these must be added the half-autobiographical *Paradis des Chats*, embodying Gautier's special affection for cats, and *Ménagerie Intime* (1869). Finally, an immense quantity of criticism of literature and art, and of the history of art: *L'Histoire des Peintres*, in collab. (1847); *L'Art Moderne* (1852); *Les Beaux-Arts en Europe* (1852); *Les Dieux et les Demi-Dieux de la Peinture*, in collab. (1856); *Histoire de l'Art Dramatique* (1860); *Histoire du Romantisme*, published in his collected *Œuvres*; *Tableaux de Sièges* (1870-1). Biographical sketches—*Honoré de Balzac* (1859), etc. An English translation of *The Works of Théophile Gautier* began to appear in 1900. See **Sainte-Beuve's Nouveaux Lundis** (1863-72); **Spoelberch de Lovenjoul's Histoire des Œuvres de T. Gautier** (1887); and books, in French, by Feydeau (1874), Bergerat (1878), Du Camp (1890; Eng. trans. 1893), and Richet (1893).

Gauze, a light transparent fabric of silk, woven with fine yarn, deriving its name from Gaza in Palestine, where it is said to have been first manufactured. It is now chiefly produced in France and Switzerland, and is extensively used for veils, dresses, sifting flour ('bolting-cloth'), etc.; a special kind is used for the mantles of incandescent lights and for the wire gauze of safety lamps.

Gavarni, **PAUL**, nom de guerre of **SULPICE GUILLAUME CHEVALIER** (1801-66), French caricaturist, born in Paris. His clever sketches of Parisian life and manners led to his appointment as caricaturist of *Le Charivari*, and he also became widely known as a book illustrator. His style, always vigorous, became steadily more refined, while the subjects with which he dealt became more universal in type. After a visit to London (1849) he devoted himself to the representation of the life of the lower classes, whose misery had struck him very forcibly. His *Œuvres Choieses* appeared at Paris (1845-8), and *Perles et Parures* (1850). Among other works, Gavarni illustrated those of Balzac, and the *Julf Errant* of Eugène Sue. See *Life*, in French, by E. and J. de Goncourt (1879), and study by Duplessis (1876).

Gavarnie, vil., Hautes-Pyrénées, France, 35 m. s. of Tarbes, near the famous Cirque de Gavarnie.

Gavazzi, ALESSANDRO (1809-89), Italian preacher, reformer, and patriot, born at Bologna, and became a Barnabite monk. After filling the professorship of rhetoric at Naples, he became a powerful influence for Liberalism among the people of Rome, and finally abjured Roman Catholicism. He played a patriotic part during the siege of Rome (1849); and on its fall he travelled in England and America, advocating the cause of the Italian Protestants. In 1860 he accompanied Garibaldi to Sicily. His Lectures in New York, with Life by Campanella and Nicolini, corrected by himself, appeared in 1853.

Gavelkind, a custom prevalent in Kent, England, according to which land devolves on intestacy on all the sons equally. A widow or a widower takes a life estate in a moiety of the deceased husband's or wife's realty.

Gaveston, PIERES, EARL OF CORNWALL (d. 1312), the favourite of Edward II., son of a Gascon knight. Brought up as the foster-brother and playmate of Prince Edward, he early attained complete ascendancy over him. For his insolence and pride he was three times banished (1307, 1308, 1312). But his last return provoked a rising of the barons, during the course of which Gaveston was taken prisoner and executed. See Marlowe's *Edward II.* (c. 1590).

Gavial, or **GHARIAL**, one of the crocodilians, differing from the common crocodile in the slender and elongated snout. The only species, *Gavialis gangeticus*, inhabits the great Indian rivers, and is quite harmless, feeding on fish. It reaches a length of twenty feet or more. An allied form is *Tomistoma Schlegelii* from Borneo, Malacca, and Sumatra.

Gavotte, a dance somewhat resembling the minuet, which flourished most in the 17th and 18th centuries. The music for it consists of an air in which there are two strains, each of four or eight bars, in $\frac{3}{4}$ or $\frac{4}{4}$ time, each strain being played twice over.

Gawain (Welsh *Gwalchmai*), hero of the Arthurian cycle, was the son of Arthur's sister and Lot, afterwards king of Norway and the Orkneys. He performed gallant deeds in the war with Rome, and died in battle against his brother Mordred. But Wace says that no one knew who slew him, or where he was buried. In the hands of the French romancers Gawain became the model of all knightly virtues, and as such he is the hero of the majority of the shorter 'epic' romances. In the Welsh *Triads* he is one of the three golden-tongued chieftains of Britain, and one of the three most

courteous to strangers. This character he maintains in English mediæval romance. Up to the time of Malory the Arthur cycle in England was really the Gawain cycle. The fine poem *Syr Gawayne and the Grene Knyghte*, and the quaint story of the *Weddyng of Syr Gawayne*, both find their earliest and best parallel in Irish tradition; while another story, only preserved in the German poem of *Dieu Crâne*, connects Gawain with the 'Isle of Women,' a recognized part of the old Irish paradise. He is frequently termed 'the Maidens' Knight,' no satisfactory explanation of the title being given. The most famous series of adventures connected with Sir Gawain, in French romance, are those related in Chrétien de Troyes's *Perceval*, of which poem he shares the honours equally with the titular hero. In the later stages of Arthurian romance the character of Sir Gawain underwent a change for the worse: in the prose *Tristan* and the *Queste* he is painted in the blackest colours. See *Sir Gawayne*, ed. by Sir Fred. Madden for the Bannatyne Club, 1839; *Histoire Littéraire de la France*, vol. xxx. by M. Gaston, Paris; *The Legend of Sir Gawain*, by J. L. Weston, Grimm Library, vol. vii. (1897); *Syr Gawayne and the Grene Knyghte*, ed. Morris, for Early English Text Society, ed. I. Gollancz (1898)—modern prose rendering by J. L. Weston.

Gawilgarh, fortress, Berar, British India, 15 m. w. of Ellichpur; was taken by Wellesley in 1803.

Gawler, munic. tship. of co. Gawler, S. Australia, 25 m. N.E. of Adelaide. Pop. (with suburbs) 5,000.

Gay, JOHN (1685-1732), English poet, was born at Barnstaple in Devonshire. Going up to London, he published his first poem, *Wine*, in 1708. In 1712 he obtained the post of secretary to the Duchess of Monmouth. In the following year he published *Rural Sports*, which he inscribed to Pope; and *The Wife of Bath*, a comedy, which was acted at Drury Lane. In 1714 he produced *The Fan*, a poem; and *The Shepherd's Week*, a series of six pastorals, written to ridicule the pastorals of Ambrose Philips. These pieces established Gay's literary reputation. In the year 1714 he became secretary to the Earl of Clarendon, ambassador to Hanover. He next wrote *What d'ye Call It?* a farce, which appeared at Drury Lane (1715); *Trivia, or the Art of Walking the Streets of London* (1716), a sprightly mock-heroic poem, and a veritable mine of information on the outdoor life of the period; and *Three*

Hours after Marriage (1717), a comedy, in which he is said to have had the assistance of Pope and Arbuthnot, but which was none the less a mortifying failure. In 1720 he published his poems, and realized £1,000, but speculated and lost it all. In 1724 he produced a tragedy, *The Captives*, and in 1727 his *Fifty-one Fables in Verse*. But his crowning achievement was *The Beggar's Opera* (1727), which for a season drove the Italian opera out of England. A sequel called *Polly* was refused a licence by the lord chamberlain, but was published in 1729. The Duke and Duchess of Queensberry now took Gay into their house, and with them he spent the remainder of his days. He was buried in Westminster Abbey. Perhaps his best known now by his *Fables* and such ballads as *Black-eyed Susan* and *'Twas when the Seas were Roaring*. Collected works are *Plays* (1760); *Works* (4 vols. 1770); *Gay's Chair: Poems never before printed* (1820); *Fables*, ed. by Austin Dobson (1882); *Poems*, ed. by J. Underhill (2 vols. 1893). See Cox's *Life* (2nd ed. 1797) and Johnson's *Lives*.

Gaya, chief tn., Gaya dist., Bengal, India, 57 m. s. of Patna by rail. Six miles to the s. is Buddha Gaya, the site of a temple dating from B.C. 543, and of a bottle sprung from that under which Buddha attained Nirvana. Gaya is annually visited by many pilgrims. Pop. (1901) 71,288.

Gayal (*Bos frontalis*), a semi-domesticated, also wild, ox in the hilly districts of N.E. India. It is smaller than the gaur, has a straight forehead without the frontal crest, smaller and straighter horns, a dewlap in the male, while the back has also a less-marked slope than in the gaur. Apparently the gaur and the gayal interbreed.

Gayangos Varce, PASCUAL (1809-97), Spanish scholar and bibliophile, born at Seville; studied in France under De Sacy, and spent many years in England. He was editor of the Spanish state papers, English Record Office, and professor (1843-81) of Arabic at Madrid University. He first attracted notice by a *Historia de los Reyes de Granada* (1842), and subsequently translated into Spanish, with additions, Ticknor's *History of Spanish Literature* (1851), and edited, in Ribadeneyra's *Biblioteca de Autores Españoles*, the '*Gran Conquista de Ultramar*' (1849), '*Libros de Caballería*' (1849), and a collection of '*Escritores en Prosa, anteriores al Siglo XV*' (1849). He also issued the English translation of Al-Makkari's *History of the Mohammedan Dynasties in Spain* (1840), a work of great erudition.

Gay-Lussac, JOSEPH LOUIS (1778-1850), French chemist and physicist, was born at St. Léonard, Haute-Vienne. After acting as assistant to Berthollet, he carried on researches into the composition of the atmosphere, in conjunction with Biot; which resulted in Gay-Lussac's important discovery that the proportions by volume in which gases combine are simply related, both to each other and to the volume of the product. An account of this theory appears in vol. ii. of the *Mémoires de la Société d'Arcueil* (1809). Important researches were those connected with the composition of water, in conjunction with Humboldt (1805); the expansion of gases under the action of heat; also the expansion of fluids, and the process of evaporation. In conjunction with Thénard he discovered a process for producing potassium by purely chemical action. The rivalry between Gay-Lussac and Davy was most acute in 1813, in connection with the question of the character of iodine, each claiming the first decision on its true nature. Valuable memoirs on iodine were published by Gay-Lussac in 1813-14. He was, in 1809, appointed professor of chemistry at the Ecole Polytechnique, and, in 1832, at the Jardin des Plantes, Paris. The later years of his life were chiefly devoted to the practical applications of chemistry in connection with fermentation, bleaching, manufacture of sulphuric acid and gunpowder. Among his numerous scientific works were *Mémoires sur l'Analyse de l'Air Atmosphérique*, in collaboration with Humboldt (1804); *Recherches Physico-Chimiques faites sur la Pile*, in collaboration with Thénard (1811); and *Cours de Physique* (1827). Some of his work appeared in the *Annales de Chimie*, of which he was joint-editor with Arago for about thirty years. For his life, see Arago (*Œuvres*, vol. iii. 1855) and Biot (*Abstracts*, Royal Society, vol. v.).

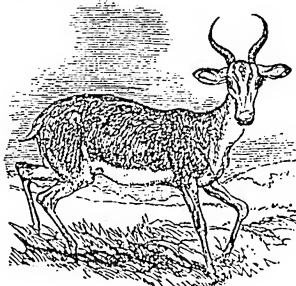
Gaylussacia, a genus of tropical American shrubs belonging to the order Vacciniaceæ. The evergreen species are much the most ornamental, and are not difficult to grow in a peaty soil in greenhouses. The flowers are borne in crowded axillary racemes.

Gaza (mod. *Ghuzzeh*), Philistine city and fortress, 3 m. from the Mediterranean. The modern town, which is the see of a Greek Orthodox and of an Armenian bishop, has a population of some 16,000. Gaza figures prominently in the story of Samson (Judg. 16:3). It was captured by Alexander the Great in 332 B.C. The crusaders built a citadel here in 1149, which resisted Saladin until 1187. It fell to Napoleon in 1799.

Gaza, THEODORUS (1398-1478), one of the pioneers in the revival of Greek, born at Thessalonica, became professor of Greek at the University of Ferrara (1447), and about 1450 went as teacher of philosophy to Rome. After three years spent under the patronage of King Alfonso at Naples (1455-8), he received from Cardinal Bessarion the living of San Giovanni a Piro in Calabria, which he held until his death. His translations include some works of Aristotle, Theophrastus, Ælian, and Cicero. His chief work was a Greek grammar, published at Venice in 1495 (new ed. 1803).

Gazaland, territory in Portuguese E. Africa, watered by the Sabi and Limpopo. The higher parts present sandy, waterless tracts matted with thorny scrub.

Gazania, a genus of half-hardy Cape plants belonging to the order Compositæ. The flower-heads are mostly orange or yellow in colour, though every shade from white to scarlet occurs. The leaves are generally woolly or hairy. The plants are easily grown in a light, warm soil preferably containing a fair proportion of peat.



Gazelle.

Gazelle (*Gazella*), a genus of small antelopes, including some of the most beautiful of these animals. The majority inhabit the sandy deserts of N. Africa, and all are of a yellowish colour, with a characteristic face-marking. This consists of a dark triangle on the forehead, defined by two white streaks, which extend from the base of the horns to the nose, and are bordered externally by dark stripes. The horns are usually present in both sexes, are oval in section, and ringed throughout. Examples are the Dorcas gazelle (*G. Dorcas*), which is barely twenty-four inches high at the shoulder; the Indian gazelle (*G. Bennettii*), occurring outside the African area; the Arabian gazelle (*G. arabica*); and the mountain gazelle (*G. Cuvieri*) of Morocco and Algeria.

Gazette. See LONDON GAZETTE.

Gazetteer, a geographical dictionary containing descriptions, statistics, and historical details of natural and political divisions—countries, cities, towns, rivers, mountains, etc.—of the world, or of any portion of it, arranged in alphabetical order. The first use of the word in this sense seems to have been made by Laurence Echard, who published *The Gazetteer's or Newsman's Interpreter* in 1703, and in 1704 the second part of the same work, produced as *The Gazetteer*. Among the best-known English works are Bryce's *Grand Gazetteer* (1759), Crutwell's *Universal Gazetteer* (1808), and the *Edinburgh Gazetteer* (1817-22). These have been superseded by more modern works, including those of Macculloch, Bryce and Johnston, Blackie, Longmans (*Times*), Jack, Oliver and Boyd, Chambers, Lippincott, Putnam, and Bartholomew. Of foreign general gazetteers it must suffice to mention Ritter's *Geog. Statist. Lexikon* (new ed. 1898), and Vivien de St. Martin's *Nouveau Dictionnaire de Géographie Universelle* (1879-95 and 1897-1900). Among special gazetteers may be enumerated those of Bartholomew (1887), Cassell (1893), and Mackenzie (1893), for Great Britain; of Lewis (1849), Dugdale and Blanchard (1860), Wilson (1866-9), and Brabner (1894), for England and Wales; of Wilson (1854-7), and *The Ordnance Gazetteer*, edited by F. H. Groome (1882-8; new eds. 1893 and 1901), for Scotland; of Lewis (1837) and Leggatt (1879), for Ireland; of Hunter (20 vols. 1875-7 and 1885-7), for India; of Colange (1884), for the United States; of Neumann (1883), for Germany; of Altavilla (1875), for Italy; of Semenoff (1862-88), for Russia; of Rosenberg (1881-3), for Sweden; of Weber (1886), for Switzerland; and the government series of departmental gazetteers for France.

Gaz-kul (also called Zor-kul, Sari-kul, Wood's Victoria Lake), on the Pamir, Central Asia, at an elevation of over 13,000 ft. Another Gaz-kul, the source of the N. branch of the Upper Oxus (the Ak-su, or White Water), lies at about 13,850 ft., near the head of the Little Pamir valley. A third lake (called also Ghaz-nor) lies at the S. foot of the Altyn or Astyn-tagh (Kuenlun system), in the N.E. of Tibet (38° N. lat. and 91° E. long.), at an alt. of about 10,000 ft.

G.C.B., (Knight) Grand Cross of the Bath.

G.C.H., (Knight) Grand Cross of Hanover.

G.C.I.E., (Knight) Grand Commander of the Indian Empire.

G.C.L.H., Grand Cross of the Legion of Honour.

G.C.M.G. (Knight), Grand Cross of St. Michael and St. George.

G.C.S.I. (Knight), Grand Commander of the Star of India.

G.C.V.O. (Knight), Grand Cross of (Royal) Victorian Order.

Géant. See CHERRY.

Géant, COL DU, glacier pass (11,060 ft.) in the Alps, leading from Chamonix in France to Courmayeur in Italy. It became well known after H. B. de Saussure spent seventeen days there in 1788, making scientific observations. The Aiguille du Géant (13,170 ft.) towers above it on the N.E.

Gearing is generally understood to refer to wheel or toothed gearing and friction gearing, with their necessary adjuncts of shafting, bearings, etc. For a description of BELT AND ROPE GEARING, and of the gearing of MOTOR CARS AND CYCLES, see the articles under those headings.

The relative motion or *velocity ratio* of wheels in gear is identical with that of toothless rollers driving one another by mutual friction without slip; consequently the velocity ratio under these conditions must be inversely proportional to their radii, diameters, or circumferences, because equal arcs must be passed over in equal times, and the length of these arcs must bear the same proportion to their circumferences, of which they form a part, as the latter do to each other. Thus, in Fig. 1 let N_1N_2 and D_1D_2 represent respectively the revolutions in a given time, and the diameters of the rolling cylindrical discs A and B; then, since there is assumed to be no slip at the point of contact,

$$\pi D_2 N_2 = \pi D_1 N_1, \text{ or } D_2 N_2 = D_1 N_1.$$

$$\therefore N_2 : N_1 :: D_1 : D_2.$$

The velocity ratio of any combination of gearing is always represented by the relation which the speed (N_2) of the last wheel bears to the speed (N_1) of the first wheel; thus, in the above cases the *velocity ratio* = $\frac{N_2}{N_1}$.

The *direction of motion* of the last wheel in a system of gearing will depend upon the number of wheels and their arrangement. In Fig. 1 several combinations are shown, and the arrows indicate the direction of motion in each case. When the axes of revolution are not parallel but intersect, the circular discs are replaced by rolling conical surfaces, as shown in Fig. 2. In order to transmit motion with accuracy, which would not be possible if pure frictional contact alone were relied upon, projections or teeth are formed upon the rolling surfaces, and the con-

tour or shape of these teeth must be such that the friction between them when in gear shall be the least possible. The rolling surfaces—cylindrical or conical—are generally called *pitch surfaces* or *pitch circles*; and these pitch surfaces, which represent the motion of the wheels, must be in contact when the wheels are in gear: the teeth are spaced round the pitch surfaces at equal distances (the *pitch*) apart. (See Fig. 3.) If T , D , and P represent respectively the number of teeth, diameter of pitch circle, and pitch, then

$$TP = \pi D, \text{ or } P = \frac{\pi D}{T}. (\pi = 3.1416.)$$

Spur wheels are used for transmitting motion between parallel shafts. *Bevel* wheels are used when the axes of the shafts intersect; and when the axes of the shafts are not parallel and do not intersect, the teeth are formed on the surfaces of frustra of two hyperboloids, such wheels being termed *skew bevel* wheels. In all the above cases the velocity ratio is assumed to be constant; but a variable velocity ratio may be obtained by means of wheels with non-circular pitch surfaces. Thus, if two equal ellipses (Fig. 4) be centred about their foci A and B, and placed in contact so that the distance between the centres is equal to the sum of the focal distances, although one of them may rotate with a constant speed, the other, or driven ellipse, will have a variable velocity. This is evident from the fact that the pitch surface radii AC and BC of the two wheels at the point of contact are continually varying. The curves generally adopted for the contour or profile of wheel teeth are the cycloidal and involute. In order that the velocity of two wheels in gear may be kept constant, it is necessary that the profiles of the teeth should be so formed that the common perpendicular to the outlines of any two teeth, when they are in contact, must pass through the point where the pitch circles of the two wheels touch. Provided the above condition is fulfilled, any curve may be used for the profiles of wheel teeth.

A *cycloid* is the path traced out by a point on the circumference of a circle, called the describing or rolling circle, as it rolls on a straight line. The profiles of teeth used in forming a *rack*, in which the pitch circle becomes a straight line, would be cycloids. If the describing circle rolls *outside* or *inside* another circle—the pitch circle—an *epicycloid* or *hypocycloid* respectively is traced out. If the diameter of the describing circle is equal to the radius of the circle in which it

rolls, the hypocycloid becomes a straight line, and the teeth formed under these conditions have radial flanks—the portion below the pitch circle. The *involute* curve is formed in the following way: If a cord be unwound from a circle and always kept taut, the curve traced out by a point in the cord will be an involute of the circle. Epicycloidal curves are used for the *face* of the teeth—the portions of the teeth above the pitch circle—the *flanks* being formed with hypocycloidal curves. Involute teeth have the same curve for both face and flank. Examples of cycloidal and involute teeth are shown in Figs. 3 and 5.

The size of the rolling circle influences the strength of the teeth. Thus, a large rolling circle forms a tooth which is narrow at the base or root. Involute teeth are generally stronger than cycloidal teeth, but they cause excessive thrust on the shaft bearings. At the same time, involute teeth possess the advantage that the wheel centres may be displaced slightly nearer or further apart without disturbing the accuracy of contact; this cannot be done with cycloidal teeth. Examples of bevel and skew-bevel wheels are shown in Fig. 6.

Teeth which have been correctly designed, made, and fitted will, after being in action for some time, show evidence of uniform contact from the point of each tooth to some distance below the pitch line. If the wheels work noisily, it will be found that the above evidence of uniform contact is wanting in some of the teeth, clearly indicating that the driving pressure is not being borne equally by all the teeth. The speed of the pitch circles in ordinary gearing is usually about 2,500 ft. per minute. Sometimes the teeth are strengthened by having a flange (called a *shroud*) cast solid, with the teeth on each side of the wheel. Sets of wheels are arranged in combinations or trains. If there is one wheel on each axis, the train is called a *simple* one; but if one or more of the axes have two wheels which rotate together, the train is *compound*. (See Fig. 7.) The numbers on the circles represent the teeth in each wheel. The greatest practical velocity ratio obtainable from a simple train is about 6 to 1. Compound trains are used when greater velocity ratios are required.

Toothed wheels are made of cast iron, cast steel, or brass. Latterly, wheels with raw-hide teeth have been largely used for high-speed gearing, especially in cases where it has been necessary to bring about a large reduction of speed—as, for example, an

electric motor driving some slow-speed machine. Here a pinion (small wheel) with raw-hide teeth is mounted on the shaft of the motor, and gears with a wheel with metal teeth on the driven machine. These gears wear very well, and run with little noise.

Mortise gearing consists of wheels with a cast-iron body or frame fitted with wood teeth or cogs. Toothed wheels are generally cast from a wood pattern, but a better method is by machine-moulding. Here two or three teeth, together with a portion of the rim, are attached to the end of an arm which can be revolved about a vertical axis; the wheel is gradually moulded by moving the arm from point to point, and taking the impression of the teeth in sand. Machine-cut wheels, in which the spaces between the teeth are cut out from the solid by means of a properly-shaped revolving cutter, are no doubt the best and most accurate.

Helical gearing (Fig. 8) is a modification of ordinary toothed gearing, in which the pitch surfaces may be cylinders or cones, as in spur or bevel gearing; but the teeth intersect the pitch surfaces in helical lines. These wheels work much more smoothly and are stronger than ordinary gearing.

Screw-and-worm gearing (Fig. 9) is a type of gearing in which the velocity ratio is independent of the radii of the pitch surfaces, the teeth of the wheels being essentially portions of screw surfaces. A high velocity ratio can be obtained with comparatively small wheels, and the axes may be at any angle. This kind of gearing is used for speed-reducing gears; but unless the wheels are very accurately constructed and run in an oil-bath, the efficiency is low, because of the large amount of friction. In ordinary worm-and-wheel gearing the worm drives the wheel, the gears not being reciprocal. The wheel contains many teeth (i.e. portions of many screw threads), and the worm one, two, or three—seldom more—complete screw threads. For each revolution of a worm with one thread the wheel will be moved round through a space represented by one tooth. Thus, with a wheel with ninety teeth and a single-threaded worm, the wheel would make one revolution for every ninety revolutions of the worm.

Power transmitted by Toothed Gearing.—The following rule is suggested by Messrs. Musgraves, Bolton, and is found to give satisfactory results:—

Let P = pitch in inches, B = breadth of wheel in inches, V = velocity of pitch circle in feet per minute. Then horse-

power transmitted = $\frac{P^2BV}{1000}$ for cast-iron wheels; horse-power transmitted = $\frac{P^2BV}{625}$ for cast-steel wheels.

We describe a few out of many applications of toothed wheels.

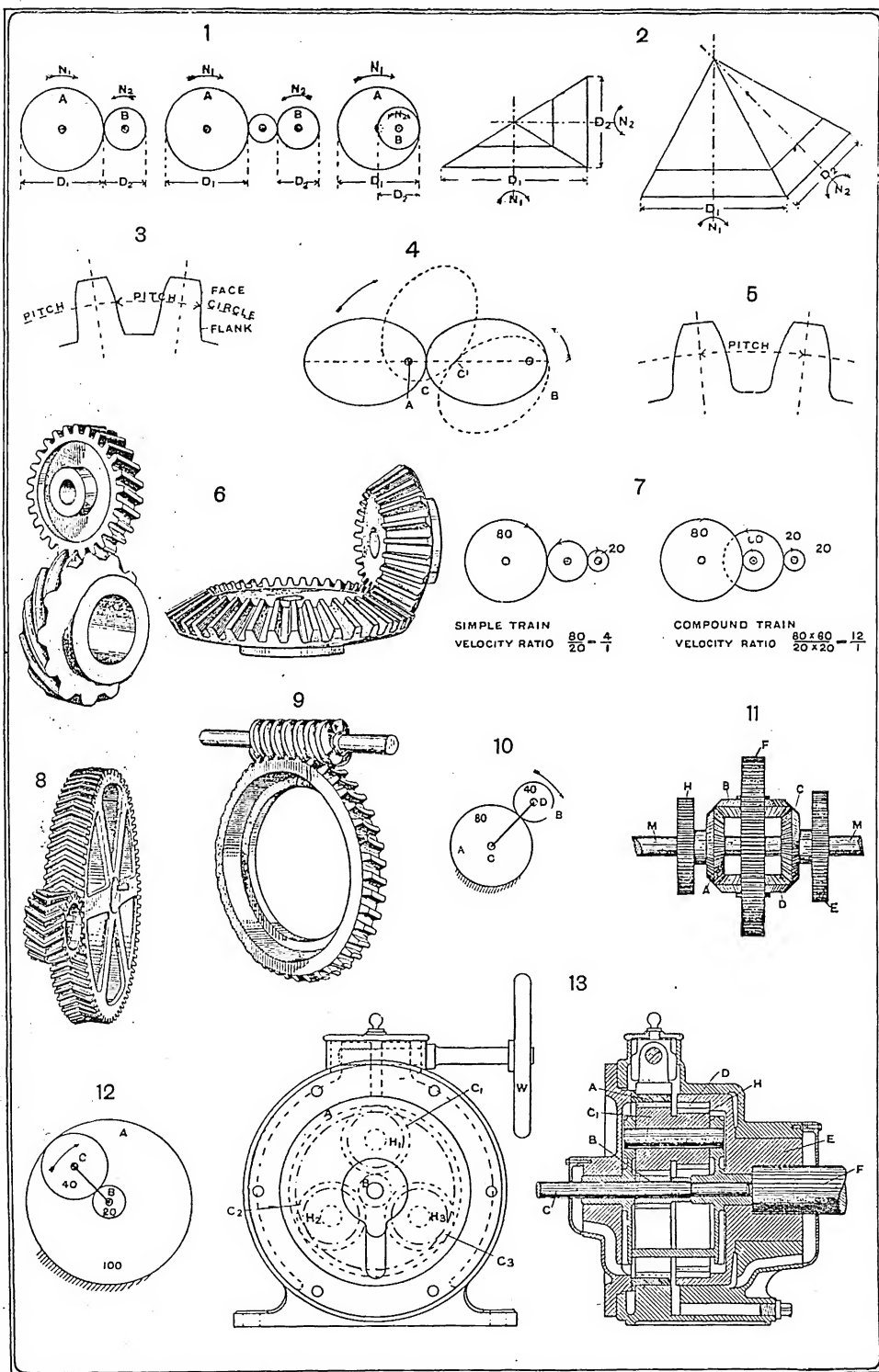
Epicyclic Trains.—In this arrangement one or more of the wheels in the train are carried round by means of a revolving arm, while they gear with a wheel which may be fixed or have an independent motion imparted to it. Points on the peripheries of the wheels attached to the revolving arm describe cycloidal curves, hence the name. In Fig. 10 a simple form of epicyclic gearing is shown. The wheel A with eighty teeth is fixed; the arm CD revolves about C as centre, and carries a wheel B with forty teeth. In this case the wheel B makes three revolutions for each revolution of the arm, and in the same direction. Watt's 'sun and planet' motion is an example of epicyclic gearing.

Houldsworth's differential gearing (Fig. 11) has a most important application in spinning machinery, where it is used to regulate the speed of the bobbins. When they are being filled with thread, the speed of revolution diminishes in such ratio as to preserve a constant tension on the thread. This gearing consists of four equal bevel wheels, A, B, C, and D, of which B and D are here shown mounted on axes, placed in the plate of a spur wheel F, and are capable of turning about their own axes while the wheel E revolves. A is keyed to a shaft M, which may be driven through a wheel H; but F and C, to which E is attached, ride loose on the shaft. A is the driver, and F receives independent motion determined by the rate at which the bobbins are being filled; E is connected with the mechanism for revolving the bobbins. If F makes three revolutions while A makes four, then C will move half as fast as A. Again, let F make one revolution for two revolutions of A; then C stops altogether. Thus, by suitably regulating the speed of F, any desired degree of revolution can be imparted to C and to the bobbins. Epicyclic gearing is also used for speed-reducing purposes. In Fig. 12, A represents a fixed annular or internally-toothed wheel with one hundred teeth; B, with twenty teeth, is attached to the high-speed shaft; and the arm carrying a wheel C with forty teeth, which gears simultaneously with A and B, is fixed to the slow-speed shaft. With this particular arrangement and proportions of wheels there would be a reduction of 6 to 1—i.e. the arm would

make one revolution for every six revolutions of B. Baker's speed-reducing gear (Fig. 13) is another example of epicyclic gearing. It consists of an internally-toothed wheel A, which is fixed when transmitting power; a wheel B is keyed to the motor or high-speed shaft C; while between A and B, and gearing with them, there are three wheels of equal size, C_1 , C_2 , C_3 , by means of which the load is distributed to three driving points. The strain is thus equalized, and the pressure upon the journal of the driving mechanism reduced. These three wheels rotate about their own axes, and are mounted on a frame which revolves round the motor-shaft axis. An internally-toothed wheel D is let into a disc E, which is keyed to the slow shaft F; connection is made between the wheel D and the wheels C_1 , C_2 , and C_3 by three wheels, H_1 , H_2 , H_3 , attached to the latter. For the following proportions (the numbers representing the teeth in each wheel—A, 96; B, 30; C_1 , C_2 , C_3 , each 33; D, 91; H_1 , H_2 , H_3 , each 28) the gear has a velocity ratio of 40 to 1—i.e. the slow shaft revolves one-fortieth of the speed of the motor shaft. The efficiency of this gear is very high (85 to 95 per cent.), and is well adapted for use in connection with electric motors, etc. The motor can be started independently of the gear, and the load gradually put on, by means of the hand wheel W, which acts on a friction brake on the outside of the wheel A. In the same way, the gear can be stopped and the motor kept always running, if desired. Various forms of epicyclic gears and speed-changing gears are used on motor cars.

Friction gearing consists of plain rollers or wheels, which may be of metal, though one of a pair of friction wheels is generally made with an acting surface of wood, compressed paper, or leather, so as to secure greater resistance against slipping. The wheels are pressed together by a force acting in the direction of the line joining their centres, so as to produce a frictional resistance sufficient to prevent slipping. Friction gearing is often used for lifts, and in situations where it is necessary to provide a rapid gear connection and disconnection. The working faces of friction wheels are sometimes formed with wedge-shaped circumferential grooves, so as to increase the resistance to slipping with a less pressure at the contact surfaces than is required with the ordinary flat wheels.

Pitch chain gearing is used instead of belts in situations where it is essential to have a more constant velocity ratio than is pos-



Gearing—Figs. 1-13.
(For explanation of Figs. see text.)

sible with belts, or in cases where considerable pressure is being transmitted. This form of gearing consists of pins and links, united to form a chain which engages with projections on suitably-formed sprocket wheels; to reduce friction, the pins are usually provided with rollers. The ordinary pitch chain is defective on account of the small bearing surface of the pins on the links. This difficulty is overcome in the Renold bush roller chain (Fig. 14), which is formed in the following manner: A tube is riveted between the pair of inside links, and this is traversed by a pin riveted to the outside links. The pin thus obtains a bearing surface on the whole length of the tube.

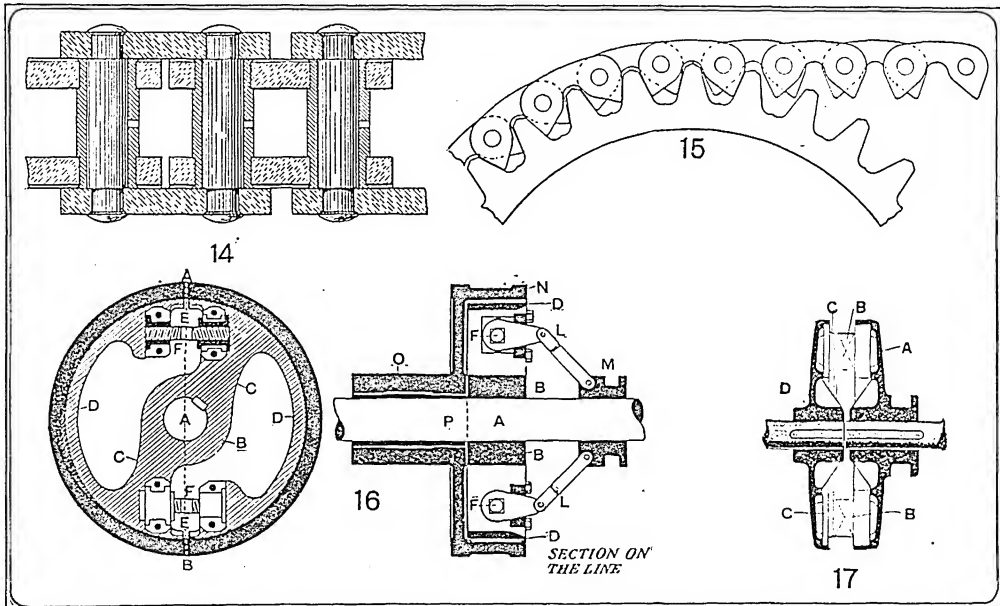
may be used in connection with the strength of ordinary steel shafting: Diameter of shaft in inches

$$= 3.66 \sqrt[3]{\frac{\text{Horse-power transmitted}}{\text{Revolutions of shaft per minute}}}$$

Lengths of shafting are usually connected by *couplings*. The ordinary form of permanent coupling consists of a cast-iron hollow cylinder or box fitted over the ends of the shafts, whose relative motion is prevented by means of a key, which is fitted in a keyway cut half into the cylinder and half into the shaft ends. In the *flange* or *face-plate* coupling the end of each shaft is provided with a cast-iron face-plate or flange fixed with keys, and the face-

to expand or contract by means of the right and left hand screws F, working in corresponding nuts. The screws F are turned by means of levers L, connected to a sliding sleeve M. When the rim D expands it binds upon the internal surface of the external shell N, causing it to rotate at equal speed. When the clutch is required to act as a shaft coupling, the shaft A is cut at P, and the boss O, or external part of clutch, is keyed to its own shaft. For rope, belt, or wheel driving, the wheel or pulley is keyed on to the boss O, which then runs loose on the shaft A.

Snyers's elastic clutch or coupling, shown in transverse section in Fig. 17, consists principally of



Gearing—FIGS. 14-17.

(For explanation of Figs. see text.)

In Fig. 15 is shown the Renold silent chain, in which a special form is given to the links. With chain gearing it is of the first importance that the chains should be well lubricated, and that the teeth on the sprocket wheels are correctly formed and spaced.

Shafts.—Toothed and other gearing must be mounted on shafts so that the motion or power may be taken off at any desired point. A shaft may be subjected entirely to a pure torsional strain; but in most cases there is, in addition, a bending strain, due to its own weight, the weight of the gearing fixed to it, the thrust of the gearing, and the tension of belts connected to the shaft. The following rule

plates are connected together by bolts. *Friction couplings* or *clutches* provide engagement and disengagement for shafts or pulleys while the machinery is in motion. The driven shaft is put into gear gradually, and the two parts of the clutch slip relatively to one another if the resistance becomes excessive. Heywood and Bridge's friction clutch as applied to a pulley or toothed wheel is shown in section and front view in Fig. 16. A is the prime mover shaft, on which is keyed a boss B; from the boss are two arms C and the rim D, forming the internal part of the clutch, and consisting of one casting. The rim D is divided transversely at E, and is made

two parts—one part A carrying a number of brushes B, made of flat steel wire; whilst upon the other part D are secured a series of finely serrated or toothed plates C. The part D is keyed to the driven shaft, and the part A can be moved longitudinally on the driving shaft, to which it is secured by a feather key. The engagement of the brushes B with the serrated plates C gives a perfectly certain—at the same time elastic—transmission of motion. For further information, see Unwin's *Elements of Machine Design*, pt. i. (1901); *Toothed Gearing*, by 'A Foreman Pattern-maker' (1893); MacCord's *Kinematics* (1883); Kennedy's *The Mechanics of Machinery* (1886).

Geber, or **GEBIR**, the reputed author of a great number of works in Arabic and in Latin, dealing with chemistry, alchemy, and allied subjects. Arabic authorities generally identify him with Jabir ibn Hayyan, who lived (probably) about the end of the 9th and the beginning of the 10th century at Cufa. Other authorities deny the existence of any real person of the name of Geber. The Latin works belong to a later date than the date of the traditional Geber. In fact, they cannot be traced back later than about the year 1300. The presumption is, therefore, that they were written by unknown authors, and by them attributed to Geber, in order to ensure for them a readier and wider circulation. The chief Arabic source of information about Geber is the *Kitab-el-Fihrist* (ed. Flügel, 1871-2). But see Berthelot's *Histoire des Sciences*, vol. iii. (1893), in which he prints the *Œuvres de Djâber*—i.e. the Arabic works. The Latin works (except one, the *Testamentum*) were translated into English by R. Russel, as *The Works of Geber* (1678). Consult also R. R. Steele's *Discovery of Secrets attributed to Geber* (Eng. and Arabic), 1892.

Gebhardt, **OSKAR VON** (1844), Protestant theologian, born at Wesenberg in Esthonia. In 1875 he became librarian at Strassburg, later at Leipzig, Halle, Göttingen (1880), and Berlin (1884). In 1893 he was placed at the head of the Leipzig University library, and appointed honorary professor of New Testament literature. He has edited *Patrum Apostolicorum Opera*, with Harnack and Zahn (1875-8; 14th ed. 1902); *Evangeliorum Codex Graecus purpureus Rossanensis*, with Harnack (1880); *Texte und Untersuchungen zur Geschichte der altchristlichen Litteratur*, with Harnack and others (1883, etc.); *Evangelium und Apokalypse des Petrus* (1893); *Psalmen Salomos* (1895); *Acta Martyrum Selecta* (1902), etc. He has also re-edited Tischendorf's New Testament (1881; 8th ed. 1901).

Gebweiler (Fr. *Guchwiller*), tn., Germany, in Alsace-Lorraine, at the east foot of the Vosges, 15 m. by rail N.W. of Mülhausen; is the seat of cotton industries, and grows good wine. Pop. (1900) 13,254.

Gecko, a small four-footed lizard, found in all warm countries, remarkable for its adhesive digits, which enable it to run along ceilings back downwards. The eyes are without movable lids; the tail is brittle; the vertebrae are remarkable in being cupped at either end (amphicelous), like those of a fish. The geckos are

insect-eaters, and are perfectly harmless to man. Examples are *Platydictylus facellatus*, which occurs on the shores of the Mediterranean, and is often found in houses in Spain and Portugal; *Hemidactylus turcicus*, another form found in S. Europe; *Tarasciscus scincus*, a desert form from Persia and Turkestan, which is without adhesive digits.



Gecko.

Ged, **WILLIAM** (?1690-1749), inventor of stereotyping, born at Edinburgh, where in 1725 he obtained practical evidence of the feasibility of printing from casts taken from set type. Two prayer books (1731) and an edition of Sallust (1744) were the only fruits of Ged's method during his lifetime. See *Life* by Nichols (1781), and *Narrative* by his daughter.

Geddes, **ALEXANDER** (1737-1802), Scottish Roman Catholic theologian, born at Arradowl, Ruthven. After visits to Paris, he was (1769) appointed to the charge of the Roman Catholic church at Auchinhalrig, Banffshire. His sympathy with the Protestants led to his removal from his charge in 1779, and the remainder of his life was spent chiefly in London. His chief work was a translation of part of the Old Testament (1792 and 1797). A volume of *Critical Remarks on the Hebrew Scriptures* (1800) forced to a climax the storm of opposition stirred by the volumes already mentioned. Embodied in them were the rationalistic conclusions of the school of Eichhorn. The book was prohibited by the Roman Catholic authorities. An unfinished translation of the Psalms appeared after his death (1807). See *Memoirs* by Dr. Mason Good.

Geddes, **ANDREW** (1783-1844), etcher and painter, a native of Edinburgh. Settling in London before 1823, he left it in 1828 for a two years' residence on the Continent, chiefly in Italy. His election as an A.R.A. took place two years after his return (1832). Among Geddes's finest works are the *Portrait of the Artist's Mother*, *Discovery of the Regalia of Scotland in 1818* (exhibited in 1821), and *Christ and the Woman of Samaria* (1841). See *Memoir* by his widow (1844); also David Laing's *Etchings by Wilkie and Geddes* (1875).

Geddes, **JENNY** (c. 1637), was, according to tradition, a 'kail-wife' or vegetable-seller in the High Street of Edinburgh. On the Sunday (July 23, 1637) when Archbishop Laud's service book was used for the first time in St. Giles's Church, Jenny Geddes flung a stool at the head of David Lindsay, bishop of Edinburgh, and caused a riot.

Geddes, **PATRICK** (1854), writer on sociological subjects and professor of botany at the University College, Dundee, since 1887. He has been responsible for the founding of several students' residences in Edinburgh. Among his publications are *An Analysis of the Principles of Economics* (1885); *Chapters in Modern Botany* (1893); *Evolution of Sea* (1889), jointly with Professor J. Arthur Thomson; and *City Development* (1904).

Gedrosia, now **BALUCHISTAN**, the most S.E. province of the ancient Persian empire. It is noted especially for the famous march which Alexander the Great made through it on his return from India in 325 B.C.

Geefs, **WILLEM** (1806-83), Belgian sculptor, born in Antwerp; gained the *Grand Prix* in 1828 for a statue of Achilles, and was appointed professor at the academy of his native town (1834). His most striking work is the *Mausoleum of the Count of Mérode*, in St. Gudule, Brussels. Other works include busts of King Leopold and the Prince Consort, statues of General Belliard, Verhaegen, Charlemagne, Rubens (at Antwerp), Grétry, and Francesca da Rimini. See *Life*, in French, by Bartholémy (1900).

Geelong, tn. in Grant co., Victoria, Commonwealth of Australia, on Corio Bay, the western branch of Port Phillip, 45 m. S.W. of Melbourne. The harbour is approached by two channels with 18 and 23½ ft. depth of water at low tide. Geelong was the first place in the colony at which woollen manufactures were established, and has a paper-mill, rope works, and several felt-mongering and wool-washing establishments. East of the town are limestone quarries. Pop. (1901) 12,399.

Geelvink Bay, a large bay on the N. coast of Dutch New Guinea. It penetrates 125 m. inland.

Geertsbergen, Belgium. See **GRAMMONT**.

Geestemünde, fort, seapt. tn., Prussian province of Hanover, on the Weser, S. of Bremerhaven; is the chief station of the German deep-sea fishing fleet. Pop. (1900) 20,116.

Geez. See **ABYSSINIA**.

Geffcken, FRIEDRICH HEINRICH (1830-96), German diplomatist and publicist, was born at Hamburg. He was successively secretary to the legation of the Hanse towns in Paris (1854), consul for Hamburg at Berlin (1856), and Hanseatic minister there (1859), and at London (1866-8). From 1872-81 Geffcken held the chair of political economy and international law at the University of Strassburg. In 1888 he published, without permission, in the *Deutsche Rundschau*, some extracts from the journal of Frederick III. An acrimonious controversy ensued; and at the instigation of Bismarck, who denied the authenticity of the extracts, Geffcken was tried for high treason, but was acquitted. He afterwards retired to Munich. Chief among his numerous works are *Die Reform der preussischen Verfassung* (1870); *Staat und Kirche in ihrem Verhältnis geschichtlich entwickelt* (1875; Eng. ed. 1877); *Zur Geschichte des Orientalischen Kriegs 1853-6* (1881); *Das Recht der Intervention* (1886); and *Frankreich, Russland, und der Dreibund* (1893).

Gefle, cap. of the Swedish co. of the same name, 93 m. N.W. of Stockholm. Gefle has a good and deep harbour, exporting (to the value of about 1½ millions sterling) bar-iron, timber, tar, and cellulose. It has shipbuilding yards and machinery, cotton, tobacco, sail-cloth, and cotton factories. Pop. (1900) 29,522.

Gegenbaur, KARL (1826-1903), German anatomist, born at Würzburg; was appointed professor of zoology and comparative anatomy at Jena (1855), but after 1858 confined himself to anatomy. Called to Heidelberg (1873), he held the anatomical lectureship there until 1901. His chief work is *Grundriss der vergleichenden Anatomie* (1874; Eng. trans., 1878, by W. F. J. Bell and Ray Lankester). His other works are *Lehrbuch der Anatomie des Menschen* (1883; 7th ed. 1899); *Die Epiglottis* (1892); and the very important *Vergleichen de Anatomie der Wirbeltiere mit Berücksichtigung der Wirbellosen* (2 vols. 1898-1901). He also edited the *Morphologisches Jahrbuch* from 1875.

Gehenna (i.e. the valley of Hinnom), usually identified with the deep gorge to the s.w. of Jerusalem (Josh. 15:8), in which was Tophet; and as it had been the scene of human sacrifices to Moloch (2 Kings 16:3), to prevent which Josiah polluted it with human bones (2 Kings 23:10), and as it subsequently became, according to Kimchi (c. 1200 A.D.), the laystall of Jerusalem, its name, with all its revolting associations, was transferred sym-

bolically to the place of final punishment. Neither in the Old Testament nor in the Apocrypha proper has the word this sense, but in the apocalyptic book of Enoch (27:2 f.; 90:26 f.) Gehenna is the ultimate abode of the lost. In the New Testament the term is used by Jesus Himself in this signification (Matt. 5:29, etc.), as denoting the place where both soul and body are destroyed (Matt. 10:28). See HELL.

Geibel, EMANUEL (1815-84), German poet, born at Lübeck. His first volume of *Gedichte* (1840; 129th ed. 1902) was very successful. He lived at Lübeck until 1852, when Maximilian II. of Bavaria offered him a professorship at Munich. After the death of the king (1868) he returned to Lübeck. His other volumes of lyric verse are *Juniustlieder* (1848; 33rd ed. 1901); *Neue Gedichte* (1868); *Heroldsrufe* (1871; 6th ed. 1902); *Spätherbstblätter* (1877); *Gedichte aus dem Nachlass* (1876). He also translated Spanish, French, and classic lyrics (1843, 1852, 1862, 1875). His pure and noble character, enlightened patriotism, and the insinuating charm and graceful rhythm of his verse, all served to endear him to his countrymen. His collected works appeared in eight volumes (1884). See K. Goedeke's (1869) and Litzmann's (1887) *Emanuel Geibel*, and Pompecki's *Heine und Geibel* (1901).

Geiger, ABRAHAM (1810-74), one of the pioneers of the new Jewish theology, born at Frankfurt-on-Main. He discharged the duties of a rabbi at Wiesbaden (1832-8), at Breslau (1838-63), at Frankfurt (1863-70), and was finally called to Berlin. His views were set forth in *Urschrift und Uebersetzungen der Bibel* (1857), *Sadduzäer und Phariseer* (1863), and *Das Judentum und seine Geschichte* (1864-71). He was one of the founders (1835) of the *Zeitschrift für Jüdische Theologie*. A collection of *Nachgelassenen Schriften* was edited by his son in 1875-8 (5 vols.). See *Life*, in German, by Schreiber (1880).

Geiger, LAZARUS (1829-70), German philosopher, born at Frankfurt-on-Main. Much discussion was raised by his works on the dependence of thought upon language, which he held to be entire. These were *Ursprung und Entwicklung der menschlichen Sprache und Vernunft* (1868-72), and *Ursprung der Sprache* (1869; 2nd ed. 1878). Others are *Zur Entwicklungsgeschichte der Menschheit* (2nd ed. 1878; Eng. trans. 1880). See Peschier's *Lazarus Geiger* (1871), and Rosenthal's *Lazarus Geiger* (1884).

Geiger, LUDWIG (1848), German man of letters, born at Breslau. In 1880 he was elected professor of literature at Berlin. His principal productions have been *Johann Reuchlin* (1871); *Petrarca* (1874); *Renaissance in Italien und Deutschland* (1882); *Berlins Geistiges Leben, 1688-1840* (1892-94); *Aus Alt-Weimar* (1897); and *Geschichte der Juden in Berlin* (1871). He has also edited Burckhardt's *Kultur der Renaissance in Italien* (7th and 8th eds. 1878-1901); *Goethe's Werke* (1880, etc.); the *Goethe Jahrbuch* (1880-1903); *Goethes Gespräche mit Eckermann* (1902).

Geijer, ERIK GUSTAF (1783-1847), Swedish historian and poet, born at Ransäter, Vermland, and became professor of history at Upsala (1817), and member of the Academy (1824). His first historical work of importance was *Svea Rikes Häfder* (1825), followed by *Svenska Folkets Historia* (3 vols. 1832-6; Eng. trans., *History of the Swedes*, 1845), one of the classical masterpieces of modern history. He also edited the papers of Gustavus III., as well as many other historical collections. As a poet, also, Geijer stands very high, his *Skaldestycken* (1835) being exceedingly popular. See *Samlade Skrifter* (10 vols. 1873-7), with biography by Hellstenius; and J. Nielsen's *E. G. Geijer* (1902).

Geijerstam, GUSTAF AF (1858), Swedish novelist. In 1882 appeared his first work, the collection of tales, *Gråkalit*, which was the forerunner of numerous romances, the chief of which are *Fattigt Folk* (1884-9), *Erik Grane* (1885), *Medusas Hufvud* (1895), *Kampen om Kyrleik* (1896), *Det Yttersta Skäret* (1898), *Aktenskapets Komedie* (1898), *Kvinnomakt* (1901), and—probably his most noteworthy book—*Nils Tresvesson og hans Moder* (1902). He belongs to the realistic school, writes with directness and force, and is at his best when depicting humble life (see his *Samlade Allmogeberättelser*, 1898, etc.). He is also a successful dramatist and a brilliant essayist.

Geikie, SIR ARCHIBALD (1835), Scottish geologist, a native of Edinburgh. Appointed to a post on the Geological Survey (1855), he won a reputation by *The Story of a Boulder* (1858) and *Scenery of Scotland* (1865; 3rd ed. 1901). Appointed director of the Geological Survey for Scotland (1867), he became professor of geology at Edinburgh University in 1871, but resigned both posts on his appointment (1881) as director-general of the Geological Survey of the United Kingdom and director of the London Museum of Practical Geology. From these he retired in 1901. Among his

publications are *Text-book of Geology* (1882; new ed. 1903); *Class-book of Geology* (1886; 4th ed. 1902); *The Ancient Volcanoes of Great Britain* (1897); *The Founders of Geology* (1897, 2nd ed. 1906); *Types of Scenery, and their Influence on Literature* (1898); also *Memoir of J. D. Forbes* (1869), *Life of Sir R. J. Murchison* (1875), *Memoir of Sir A. C. Ramsay* (1895), *Landscape in History* (1905), and the autobiographical *Scottish Reminiscences* (1904).

Geikie, JAMES (1839), Scottish geologist, brother of Sir Archibald Geikie, born at Edinburgh, became a member of the Geological Survey (1861). In 1882 he succeeded his brother in the Murchison chair of geology at Edinburgh. A specialist in the influence of glacial action, he has published *The Great Ice Age* (1874; 3rd ed. 1894); *Historical Geology* (1875); *Prehistoric Europe* (1881); *Fragments of Earth's Lore* (1893); *Earth Sculpture* (1898); and *Structural and Field Geology* (1905). His *Outlines of Geology* (1886; 4th ed. 1903) is the leading work of its kind. He has also issued a translation of *Songs and Lyrics by Heinrich Heine and other German Poets* (1887). He was one of the founders of the Royal Scottish Geographical Society.

Geiler von Kaisersberg, JOHANNES (1445–1510), German preacher, born at Schaffhausen. From 1478 until his death he was preacher at the Strassburg cathedral. Geiler was the greatest pulpit orator of the 15th century, and did much to prepare the way for the reformation. An edition of his *Schriften* appeared at Freiburg in 1877–83. See *Life*, in French, by Dacheux (1876).

Geislingen, tn., Württemberg, 20 m. by rail N.W. of Ulm, with wood and ivory carving, and glass and iron works. Pop. (1900) 7,050.

Geissler, HEINRICH (1814–79), German inventor and physicist, was born in Saxe-Meiningen, and, after spending some time in Holland, settled at Bonn in 1854. He gained a wide reputation as the inventor of various physical and chemical apparatus, such as that by means of which, with Plücker, he found water to reach its maximum density at 3°8' C. Among his other inventions are a vaporimeter, mercury air-pump and aerometer; but his name is chiefly associated with the Geissler tube, in which the interrupted electric current is made to pass through rarefied gases.

Geissomeria, a genus of tropical evergreen shrubs belonging to the order Acanthaceae. They bear spikes of scarlet, velvety flowers, and are easy of cultivation in stovehouses in Britain. They

are propagated usually by means of cuttings.

Geissorhiza, a genus of Cape bulbous plants belonging to the order Irisaceae. They are of many colours, usually very bright. They like a sandy soil containing a proportion of peat. Usually they require greenhouse temperature, but in warm, sheltered spots they may be grown out of doors in some parts of Britain. They are not unlike *ixias* in the form of their flowers.

Gela, Greek colony on the S. coast of Sicily, founded by Rhodians and Cretans in 688 B.C. It soon became prosperous, and under Hippocrates and Gelon it was for a short time the chief city in Sicily; but the latter, on getting possession of Syracuse, moved half its inhabitants thither, and after that its importance declined. In 405 it was taken by the Carthaginians. It was again destroyed by Phalaris of Agrigentum in 280 B.C., and had ceased to be inhabited by the time of Augustus. Æschylus died here in 456 B.C.

Gelasimus, the genus to which belongs the calling-crab.

Gelasius, name of two popes. (1.) **GELASIUS I.** (d. 496), of African descent, became Pope in 492. He strenuously upheld the supremacy of the papal power, was a stern opponent of Pelagianism, and expelled the Manicheans from Rome. The *Decretum Gelasii de libris recipiendis et non recipiendis* is regarded by some authorities as a forgery. Canonized on his death, November 18 was assigned to St. Gelasius in the calendar. See Roux's *Le Pape Saint Gélase I.* (1880). (2.) **GELASIUS II.** (formerly Giovanni da Gaeta) became Pope on the death of Paschal II. in 1118, but was driven into France by the Emperor Henry V., and died in the monastery of Clugny, near Mâcon, in the following year.

Gelatin is the nitrogenous product obtained by the action of boiling water on the collagen of skins or the ossein of bones, and differs only from glue and size in the care with which it is made. The common variety of gelatin is prepared from the clippings and parings of hides, and the finer variety from calves' feet. Hide parings are soaked in weak alkali, decolorized with sulphurous acid, washed with water, and finally heated with water by means of steam. The hot solution is strained, poured into moulds, and allowed to cool. The jelly, being cut into slices, is dried on nets stretched horizontally. Gelatin is largely used in cookery and confectionery, in the preparation of photographic plates and papers, and in pharmacy.

Gelderland, prov. of the Netherlands, E. of the Zuider Zee; is traversed by the Waal, Lek, and Rhine, and by the IJssel, and has the Maas (Meuse) along part of its southern border. The soil in the Betuwe district, in the south, is of exceptional fertility. There are various industries—paper, bricks, cotton, spirits, sugar. Cap. Arnhem. Area, 1,964 sq. m. Pop. (1899) 566,549.

Geldern, tn., Prussian prov. of Rhineland, 19 m. N.W. of Krefeld. Its defensive works were dismantled in 1764. It was the residential capital of the dukes of Geldern. Pop. (1900) 6,356.

Geldner, KARL (1853), German Orientalist, born at Saalfeld, Saxe-Meiningen. Since 1890 he has been professor of Oriental languages at Berlin. He has published 70 *Lieder des Rigveda* (1875); *Metrik des jüngern Avesta* (1877); *Studien zum Avesta* (1882); *Vedische Studien* (1889–1901); an edition of the *Avesta* (1886–94); and *Sanskritische Drücke* (1900, etc.), a collection of texts.

Gelée, CLAUDE. See **CLAUDE LORRAINE**.

Gelimer, king of the Vandals (530–4), great-grandson of Genserik, usurped the throne of his cousin Hilderik (530), but was defeated by Belisarius at Carthage (533), and at Bulla in Numidia, where he was taken prisoner, and the Vandal kingdom in Africa overthrown.

Gell, SIR WILLIAM (1777–1836), English classical archaeologist and scholar, born at Hopton, Derbyshire. A diplomatic mission to Greece (1801) led to his *Topography of Troy and its Vicinity* (1804). His next works were *Geography and Antiquities of Ithaca* (1807), an *Itinerary of Greece* (1810), *Pompeiana*, a work on Pompeii (1817–19), in which he was assisted by J. P. Gandy; but *Pompeiana II.*, by Gell alone, appeared in 1832. His later years were spent in Italy, where he died.

Gellert, the name of the faithful greyhound of Prince Llewelyn of Wales. Bethgelert, in the county of Carnarvon, commemorates the old legend. See the Hon. W. R. Spencer's ballad, *Gellert's Grave* (1850).

Gellert, CHRISTIAN FÜRCHTEGOTT (1715–69), German writer, born at Hainichen in Saxony, and associated with the *Bremer Beiträgen*, who rebelled against the authority of Gottsched. He began lecturing at Leipzig in 1745, and was made professor of philosophy (1751). His *Fabeln und Erzählungen* (1746 and 1748) were more widely read than any other book in the 18th century. Gellert's *Geistlichen Oden und Lieder* (1757) have none of Luther's vigour or of Gerhardt's mystic devotion, but are senti-

mental and correct, and enhanced his reputation. His complete works have been edited by A. Schullerus (1892); a selection by Fr. Muncker is given in *Kürschner's Deutsche Nationalliteratur*, No. 43. See also K. O. Frenzel's *Ueber Gellerts religiöses Wirken* (1894); and *Gellert*, adapted by M. M. Campbell (1879).

Gellius, AULUS, a Roman grammarian, who lived between 117 and 180 A.D. His *Noctes Atticae* discusses historical, antiquarian, philosophical, and philological questions, and contains a great number of extracts from Greek and Roman writers. Edition: Hertz (new ed. 1903; Eng. trans., Beloe, 1895).

Gellivara, rich iron-ore mt. in extreme N. of Sweden, 131 m. N.N.W. of Luleå, with which it is connected by rail. Over one million tons of ore from it are exported annually. The railway from Luleå (1880-94) was in 1898-1904 continued to the west-north-west, past the rich iron-ore mountains of Kirunavaara and Luossavaara, to the ice-free port of Narvik (Victoria Harbour), on Ofoten Fjord, in Norway, a distance of 147 m. Pop. (1900) 11,745.

Gelnhausen, decayed tn. of Prussian prov. of Hesse-Nassau, 27 m. by rail N.E. of Frankfurt-on-Main. On an island in the river stand the ruins of the imperial palace built by the Emperor Frederick Barbarossa in 1170 or earlier, which was destroyed by the Swedes in the Thirty Years' war. Pop. (1900) 4,589.

Gelon, a Sicilian Greek, despot of Gela and afterwards of Syracuse. He greatly increased Syracuse by including Achradina within a new wall; and to fill his new city he moved to it half the population of Gela and all that of Camarina, and also the nobles of Megara and Euboea. He ruled with justice and moderation, and defeated the Carthaginians under Hamilcar, at Himera, in 480 B.C.

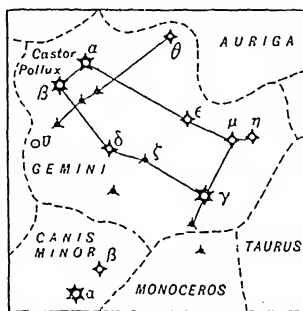
Gelsemium nitidum, or *G. SEMPERVIRENS*, a half-hardy, evergreen, twining shrub, a native of the southern states of U.S.A. It bears long, yellow, sweet-scented flowers in spring. *Gelsemium* belongs to the order Loganiaceae. It is easy to grow in moderately rich soil, and may be propagated by cuttings.

Gelsenkirchen, tn., Prussia, prov. Westphalia, 6 m. N.E. of Essen; has coal mines and iron works. Pop. (1905) 46,898.

Geltru, tn., Spain. See *VILLANUEVA GELTRU*.

Gemini (Lat. 'twins'), a zodiacal constellation, and the third sign of the zodiac, entered by the sun about May 20, and marked by the symbol II . The bright stars Castor and Pollux indicated

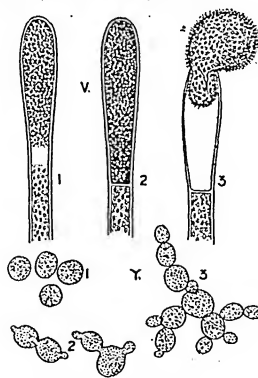
respectively, in classical times, the heads of the two constellation figures. Nova Geminorum was discovered by Professor Turner on a photograph taken at Oxford on March 16, 1903. U Geminorum is a remarkable, irregularly periodic variable; while η and ζ Geminorum are variable spectroscopic binaries, being periodic in both motion and light. The constellation includes, besides, the interesting planetary nebula N.G.C. 2392, and the fine cluster M 35. The Milky Way traverses the feet of the Twins.



1. α 2. β 3. γ 4. δ

The Constellation Gemini.

Gemination, a process occasionally observed in plants, chiefly in those with simple organization. It consists in the protoplasmic contents of a cell pushing out the cell-wall at a given point so as to form a bud or warty prominence. This increases in size, and becomes cut off from the parent cell by a dividing cell-wall. The process is well seen in *Vaucheria* and Yeast (*Saccharomycetes*).



Gemination.

V, *Vaucheria*; Y, yeast; 1, 2, 3, successive stages of growth.

Gemmi Pass, an Alpine pass (7,641 ft.) connecting Kandersteg in the Bernese Oberland with Leukerbad in Valais.

Gems and Precious Stones.

It is customary to class as gems precious stones and those shells and similar materials which have been enriched with engraved designs cut into or upon their surfaces. When these designs are engraved beneath the surrounding surface they are termed intaglios, and are chiefly used as signets or seals, the impress on wax or other yielding substance showing the design reversed and in relief. If the subject carved is in relief and above the surface of the ground, the gems are then known as cameos. Precious stones connote chiefly those substances, other than metals, which from their rarity, beauty of appearance, and, to a less degree, hardness and durability, are prized for their costliness or ornamental and symbolical attributes, and are used in connection with the goldsmiths' and jewellers' art.

In the East precious stones have been especially treasured, and used for the richest and costliest ornaments. Often invested with symbolic meaning, precious stones have also been regarded with superstitious awe and credited with mysterious qualities by those who possessed them—e.g. in Scott's *Talisman*.

The earliest records of gems are those of the Babylonian, Assyrian, and Egyptian races, each of whom possessed cylindrical stones engraved in intaglio, and mounted into ring shapes of gold, centuries before the Christian era. Oval-shaped gems of a beetle-like form, and hence called scarabs, were common among the Egyptians, the scarab being regarded as the emblem of eternity. The name was afterwards applied in other countries to gems of similar shape, although not carved to the actual likeness of a beetle. Greek gems are generally of most exquisite finish, in both subject and treatment, and are chiefly in intaglio, although others of cameo form were also in use. Carnelian, agate, amethyst, sard, and crystal were the stones most frequently selected. The Romans used shells and stones also in which layers of different colours occur, as in onyx, so that very beautiful effects were obtained by carving the cameo in one or more coloured layers upon a ground of another colour. In early Christian worship vessels and objects of gold and silver were enriched with gems and precious stones. But it was not until the Italian renaissance that the art of gem engraving revived. In the 18th and 19th centuries, in England, shell cameos for brooches, and engraved seals worn in bunches at the end of the watch-chain or ribbon, were much in vogue, but the custom has almost died out.



Gems and Precious Stones.

1. Kimberley diamonds on the matrix. 2. The Koh-i-noor. 3. Colenso diamond. 4. Hope blue diamond. 5. Ruby (crystal); 6. do., cut. 7. Sapphire (crystal); 8. do., cut. 9. Topaz (yellow crystal); 10. do., cut; 11. do. (pink), crystals on the matrix; 12. do. (greenish), crystals on the matrix. 13. Opal, layer on a rock. 14. Garnet, single large crystal; 15. do., crystals on the matrix. 16. Turquoise on rock. 17. Agate, a slice polished. 18. Onyx cut for scarf pin or sleeve link. 19. Greco-Roman cameo of four layers—Roman ladies as Minerva and Diana. 20. Assyrian intaglio cylinder of chalcedony. 21. Carnelian-onyx cameo. 22. Rock crystal cameo. 23. Amethyst crystals. 24. Head of Medusa carved in emerald. 25. Emerald on the matrix. 26. Spanish brooch of emerald and gold (16th century). 27. Head of Medusa carved in emerald (Italian Renaissance work).

Gems with engraved designs cut into their surfaces are termed intaglios; those with designs carved in relief are known as cameos. Intaglio gems are of very ancient origin, and fine examples are highly esteemed as works of art; while genuine antique cameos signed by the artist are of extreme rarity.

Precious stones used by the goldsmith and jeweller are invariably cut and polished before they are mounted. In their natural state precious stones are generally dull, and often coated with a layer of crust which conceals their true beauty. Although we may divide them roughly into two classes, transparent and opaque, there are many stones which occupy an intermediate position. The transparent stones include the diamond, ruby, emerald, sapphire, topaz, and garnet or carbuncle. The opal is semi-transparent, depending for its beauty upon the tiny fissures which penetrate it and disperse the light, and so produce its brilliancy and fire. Turquoise, agate, onyx, lapis lazuli, cat's-eye, moonstone, and jade are more or less opaque.

The cutting and polishing of precious stones is a very delicate and difficult operation, requiring much skill on the part of the worker, especially when dealing with large stones of great possible value. Diamonds are generally cut with a flat surface or table, surrounded by smaller planes called facets, which are inclined at angles to the upper surface. The circumference of the stone is called the girdle, and by this it is afterwards secured by small claws or projections of gold when set by the jeweller. Below this girdle the stone is again faceted in a pyramidal form; on an ordinary 'brilliant' cut stone there are in all fifty-eight planes or facets. Other transparent stones are cut in a similar manner. Smaller diamonds are often treated, but not so frequently as in the 17th and 18th centuries, in what is known as 'rose' cut, the upper surface being shaped to triangular facets of nearly equal size throughout. This design is suitable for stones that are too thin to be cut as brilliants. Emeralds are often cut with a rather large flat top with a series of sloping bevelled facets, and are then termed 'trap' or 'step' cut. The object of cutting transparent stones is, of course, to secure the brilliancy and play of reflected and refracted light from and through the polished facets. Opals, turquoises, moonstones, cat's-eyes, and opaque stones are cut *en cabochon*—i.e. rounded on their upper surfaces and flat or rounded on their under sides. Carbuncles are also treated in this way; when cut with facets they retain their original name of garnets. Pearl, coral, amber, and jet are called precious stones, although they are not of stone-like formation.

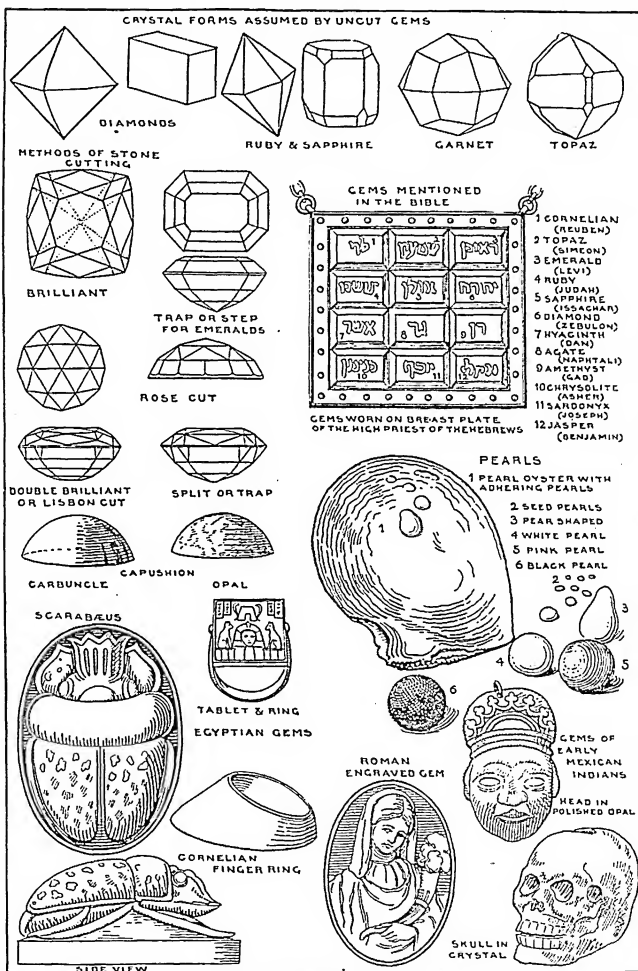
In London, Hatton Garden is the great centre of the diamond

and precious stone dealers; the manufacture of jewellery and diamond mounting and setting is chiefly carried on in Clerkenwell and Soho.

Artificial gems are of two kinds: (1) those in which a substance identical in composition with the real gem is prepared, and (2) those in which the real gem is simulated by a substance of different composition. Of the

bichromate in the former case and of cobalt oxide in the latter.

Imitation stones of the second class are chiefly produced from a heavy lead glass known as *paste* or *strass*, which is of high refractivity, and can be coloured by the addition of traces of various metallic oxides, etc. Another variety of fictitious gem is that in which a thin slice of a real stone is used as a surface to an

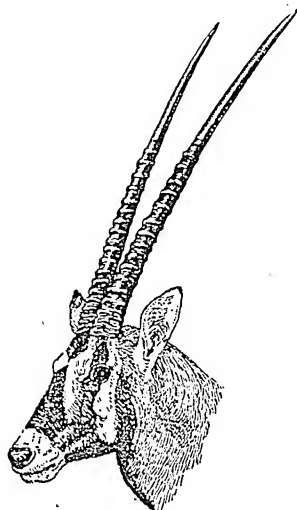


Gems and Precious Stones.

first class there are not many examples; the diamonds produced by Moissan by crystallization of solutions of carbon in molten iron under enormous pressure not being large enough to class as gems. Genuine rubies and sapphires of marketable size have been obtained by heating barium fluoride with alumina, in the presence of a trace of potassium

imitation one, or where a cheap stone, such as the garnet, is substituted for a genuine one of similar appearance, such as the ruby. Precious stones are also often improved in colour by heating, or staining in various solutions. See King's *Handbook of Engraved Gems* (1885); Streeter's *Precious Stones and Gems* (1898); Church's *Precious Stones* (1875).

Gemsbok (*Oryx gazella*), a S. African antelope, which reaches a height of about four feet, and has long straight horns ringed for about half their length. With these horns the gemsbok can transfix a lion; they have been known to reach a length of 47½ in. There is a tuft of hair at the animal's throat, and the head, body, and limbs bear black markings.



Head of Gemsbok.

Genappe, tn., prov. Brabant, Belgium, 17 m. S.E. of Brussels. It was the scene of a Prussian victory over the French on June 18, 1815. Pop. (1900) 2,044.

Gendarmes, originally the French equivalent of the British Horse Guards and Life Guards—the household cavalry. Subsequently the term was applied to continental soldiers who were selected to act as military police and perform escort duties. Nowadays it is applied in France (since 1791) to the ordinary police, whose costume is partly civil and partly military. A similar body of men, employed in similar duties, has existed in most German states since 1809.

Gender. Most languages, it seems, exhibit no distinction of gender, but in the Semitic and Indo-European groups it is an important feature. In the Semitic languages the bare stem is used as the masculine form in nouns, adjectives, and the third person perfect of verbs. The feminine endings are thus later acquisitions. Many feminine nouns have no special termination. In the Indo-European group, probably, at first, the only endings marking gender were also feminine, and few in number; other endings may have acquired a masculine significance by con-

trast. It is not to be assumed that in either group the early feminine endings expressed distinction of gender from the beginning. The case of pronouns and verbs (Semitic) is more complicated.

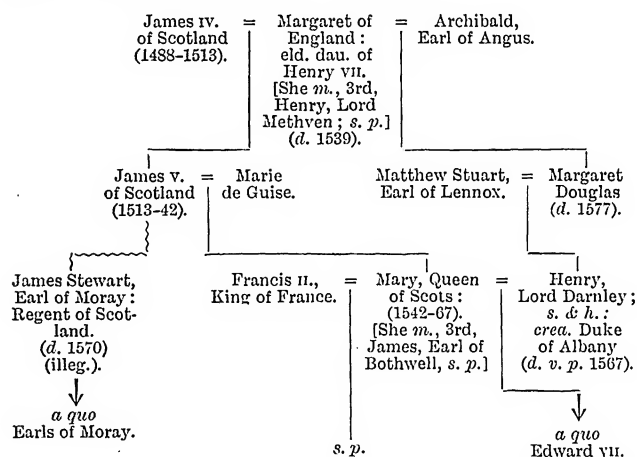
At first, no doubt, the grammatical distinction of gender corresponded to the natural distinction of sex in men and animals. But the names of inanimate objects naturally also acquire grammatical gender. They may be assigned to one or other of the original genders, under the influence of personification and analogies of termination; or a third gender, neuter, may be created to include them or a majority of them.

Grammatical gender sometimes follows the termination of the word, sometimes the character of the object. Fluctuations of gender are of common occurrence. Change is sometimes caused by conflict between natural and terminational gender. See GRAMMAR.

Genealogy, an account or tabulated statement of the ancestors or descendants of a par-

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tinuous person or family. The nations of the East, notably Arabs and Jews, carefully traced and preserved their genealogies; and the same trait appears in the Celtic races of Western Europe. Among the Celts special officers were attached to each clan or sept, whose office it was to preserve the pedigrees of the chief families. Among the Norman and so-called Anglo-Saxon races, on the contrary, little heed was paid to the preservation of pedigrees, and Palgrave (*Hist. of England and Normandy*, i. 704, 1851) shows the unreliability of the pretended early descents of Norman houses. The feudal system and the growth

of heraldry fostered genealogical study, but the early efforts in this direction were fantastic to a degree. Critical genealogical research may be said not to have existed in England until the 16th century, when the College of Heralds began to make visitations of the various counties at stated intervals. These visitations, which record all genealogies of which proof could be obtained, continued until about 1680, when the need for them ceased with the improved character of parish records, the recording of pedigrees at the Heralds' College, and the growth of a reliable literature upon the subject. In Scotland a register of genealogies exists in the Lyon Office, in which the pedigrees of claimants are entered after the heralds have fully tested the evidence. In Ireland, the Ulster Office exercises similar functions. A genealogy is frequently represented in the form of a tree, showing the branches of the family. A modification of the tree is the genealogical table, of which the following is a brief familiar example:—

General. (1.) In the Roman Catholic Church, the supreme head of a religious order, with the exception of the *abbas abbatum* of the Benedictines. The office is usually held for three years (that of the Jesuits for life), is elective, and confers the privilege of voting in a general council. Other uses of the word are: general council (a council of the whole church), vicar-general (the chancellor of a diocese), and general confession (of one's whole life). (2.) In the British service, an officer ranking next below a field-marshal. The term is also used colloquially with regard to lieutenant-general, major-general, and brigadier-general. At present there are twenty generals on the active list, of whom the senior is Prince Christian. Promotion is by selection from the lieutenant-generals' list.

General Assembly, specifically applied to the supreme courts of the Established Church of Scotland, the United Free Church of Scotland, the Free Church of Scotland, and the Presbyterian churches of Ireland and America. In the case of the Established Church of Scotland, the Assembly is attended by the Lord High Commissioner, who is appointed by and represents the crown. The Scottish Assemblies are held in May each year, and in the case of the two larger churches extend over ten or twelve days. The Established Church Assembly is composed of delegates from every presbytery, university, and royal burgh in Scotland; the constitution of the other Assemblies is similar, with the exception of the corporate and university representatives. All the Assemblies have judicial and legislative powers; they are courts of appeal, and determine cases referred to them by the inferior courts; they also exercise a general superintendence over the discipline of the church. In their legislative capacity they enact statutes binding on the Assembly itself and on the inferior courts. Rash legislation is prevented by the Barrier Act, which requires every proposed statute to be submitted to the consideration of the presbyteries, and to be approved by a majority of the presbyteries before it can be enacted.

General Average. See AVERAGE, INSURANCE, etc.

Generalization, in logic and philosophy, signifies the mental operation by which, disregarding in a number of objects or persons the merely accidental differences, and considering solely the remaining qualities or characteristics that are common to all of them, we form a 'general idea' of the objects or persons, in so

far, at any rate, as they all agree. The formation by the mind of this 'general idea' is termed 'generalization.'

General Staff. In all well-organized armies this consists of a department which devotes undivided attention to all military problems, and of a body of officers occupied in training all ranks of the army, and prepared to direct operations in the field. The British general staff was formed in February 1904 as a result of a recommendation of Lord Esher's Reorganization Committee, which regarded this staff as 'one of the most pressing military needs.' Many of the duties, however, usually transacted by a general staff are in Great Britain dealt with by the Committee of Imperial Defence.

General Steam Navigation Company, a British company running steamships to popular south coast of England resorts, but having also an extensive service to the continental ports, as well as to the chief ports of the British Islands. The company was established in 1824, and became a limited liability company in December 1902. It possesses a fleet of 50 steamers, aggregating 54,664 tons.

Generations. ALTERNATION OF. See ALTERNATION OF GENERATIONS.

Genesee, riv., rising in Potter co., Pennsylvania, U.S.A., and flowing N.W. and N.E. through W. New York to Lake Ontario, N. of Rochester. It is remarkable for its falls (Rochester, Portage, etc.), which supply power.

Genesis, the first book of the Bible. The book falls into two main parts: (1) ch. 1-11, a rapid survey of primeval history, giving the 'generations' of the heavens and the earth, Adam, Noah, Noah's sons, and, in particular, Shem; (2) ch. 12-50, a more detailed account of the patriarchs Abraham, Ishmael, Isaac, Esau, Jacob and his twelve sons. The last chapters show Jacob and his sons in Egypt, and when the curtain rises again in Exodus these have grown to a great people, the children of Israel. The narratives grow in detail and circumstantiality as they proceed, and make it plain that the (final) writer had proposed to himself the definite task of narrating the various stages by which the people of Israel came into being. The existence of this plan may seem to form an *a priori* objection to the now commonly accepted theory that Genesis is a compilation of various documents; but one of the main writings, denominated P, which covers the whole ground, has been made a kind of framework into which the final editor has fitted the other narra-

tives (J, E) and his own contributions. The whole delineation is transfused with a lofty ethical and religious interest. For the mode of composition and for critical literature, see HEXATEUCH; also *Commentaries* by Delitzsch (1869), Dillmann (1881); Spurrell's *Notes* (1896); M. Dods, in *Bible Class Handbooks Series* (1879), and in *Expositor's Bible*.

Genette (*Genetta*), a small animal allied to the civet, from which it differs in its smaller size, more elongated body, and shorter limbs, as well as in the absence of a pouch for storing the secretion. The tail is long, and the fur short and soft, and usually spotted. The teeth are compressed and sharp pointed. The common genette (*Genetta vulgaris*) is found in the south of France and in Spain, as well as in Africa; all the other species are African. Genettes are often kept as pets in houses to destroy rats and mice.



Genetta.

Geneva. (1.) Swiss canton, with Lake Geneva to the N., and France on the E., S., and W. It was admitted into the confederation in 1815. Area, 108 sq. m. In 1900 the population was 132,609, of whom the majority (67,228) were Roman Catholics and (110,058) French-speaking. The chief industries are watchmaking and the manufacture of jewellery. (2.) Capital of above canton, on both sides of the Rhone, just where it issues from the Lake of Geneva. The old city, including the section called Eux Vives, lies on the l. bk.; the Quartier St. Gervais, inhabited mainly by the industrial classes, is on the r. bk. The old city has numerous irregular streets, and fronting the river and lake fine quays and avenues. The cathedral is Byzantine in character, and is said to have been built in 1124. Nine bridges span the Rhone. In the newer portion of the city along the lake shore are numerous hotels, squares, parks, and gardens, notably the Jardin Anglais. Other places of interest are Calvin's house; the 16th century Hôtel de Ville; the botanic gardens and university opposite to the interesting Corratier, formerly one of the ramparts of the city; several museums, including the Musée Rath; and the Ile Jean Jacques Rousseau. Geneva has become important as an educational centre. As an

industrial city it is renowned for its clock, watch, musical box, scientific instrument, and jewelry manufactures, its annual output in these departments being valued at one and a half million pounds sterling. Diamond cutting and enamelling are also carried on. The chief historical fame of the city rests on the severe rule of John Calvin (1541-64), the reformer. In 1798 the republican army marched in and annexed it to France. Among the many distinguished men born in Geneva may be mentioned Rousseau, De Saussure, De Candolle, Sismondi, Cherbuliez, Bonnet, Casaubon, and Spanheim. Pop. (1900) 59,437; or, including suburbs, 105,710. (3.) LAKE OF, between the French dep. of Haute-Savoie and the Swiss cantons of Geneva, Vaud, and Valais. Its greatest length

castle of Chillon), Evian, and Thonon-les-Bains. (4.) City, Ontario co., New York, U.S.A., at the foot of Seneca Lake, 108 m. E. of Buffalo. It has great nurseries for seeds and plants. The State Experimental Agricultural Station is situated here. It is also the seat of Hobart College (1822). Pop. (1900) 10,433.

Geneva Convention was the expression of a universal desire to establish rules for the amelioration of the condition of the sick and wounded in war, and was indirectly due to the Crimean war and the French war in Italy of 1859, especially the battle of Solferino. The first convention was signed on Aug. 22, 1864, by the representatives of twelve European states and Persia, and afterwards acceded to by practically every civilized nation. It provides for the neu-

be adopted for hospitals, ambulances, and evacuations, and an armlet for individuals neutralized. In 1868 a similar series of additional articles were signed, whereby the neutral status of military hospitals and the persons engaged in their service was extended to hospital ships. These are painted white, with green strake. The principles of the Geneva Convention were extended to naval warfare by the Hague or Peace Convention of 1899.

Geneviève, SAINTÉ (249-502), patron saint of Paris, born at Nanterre, near Paris. She spent the greater part of her life in Paris, engaged in works of benevolence.

Genghis Khan. See JENGHIZ KHAN.

Genipap, the fruit of a W. Indian evergreen tree, *Genipa americana*, belonging to the order Rubiacæ. The fruit is large, succulent, pale green in colour, and contains a purplish juice. The pulp of the fruit is edible. The tree may be grown in stove-houses, in a soil consisting of one-half peat. It may be propagated by means of cuttings.

Genista, a genus of dwarf shrubs belonging to the order Leguminosæ. They bear mostly yellow flowers, and are of the easiest culture in ordinary garden soil. Among the species which are natives of Britain are *G. tinctoria*, *G. anglica*, and *G. pilosa*.

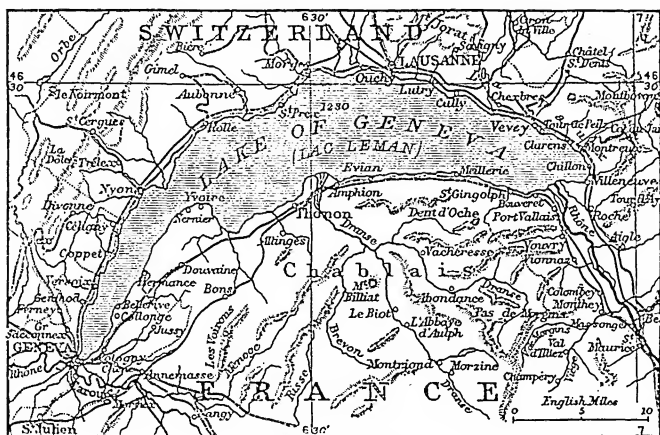
Genitive. See GRAMMAR.

Genitrix, 'the mother,' a title given by Ovid to Cybele; also a surname of Venus.

Genius, a protecting spirit which, in the belief of the ancient Romans, was attached to every human being from his birth, and which he worshipped, especially on his birthday. The marriage bed (*lectus genialis*) was sacred to the genius. Places also had their geni. The Greeks believed in similar spirits, which they called *dæmones*.

Genlis, STÉPHANIE FÉLICITÉ DUCREST DE SAINT-AUBIN, COUNTESS DE (1746-1830), French writer, born at Champérier, near Autun; was lady-in-waiting to the Duchess de Chartres, governess of her daughters, and afterwards tutor to the sons of the family. She published *Théâtre de l'Éducation* (1779-80), a collection of comedies for the young, and *Adèle et Théodore* (1782). In 1793 she took refuge in Switzerland, and afterwards in Hamburg, but in 1799 returned to Paris. Her best-known works are her *Mémoires* (1825), and a romance, *Mademoiselle de Clermont* (1802). See *Life* by De Chabreuil (1900).

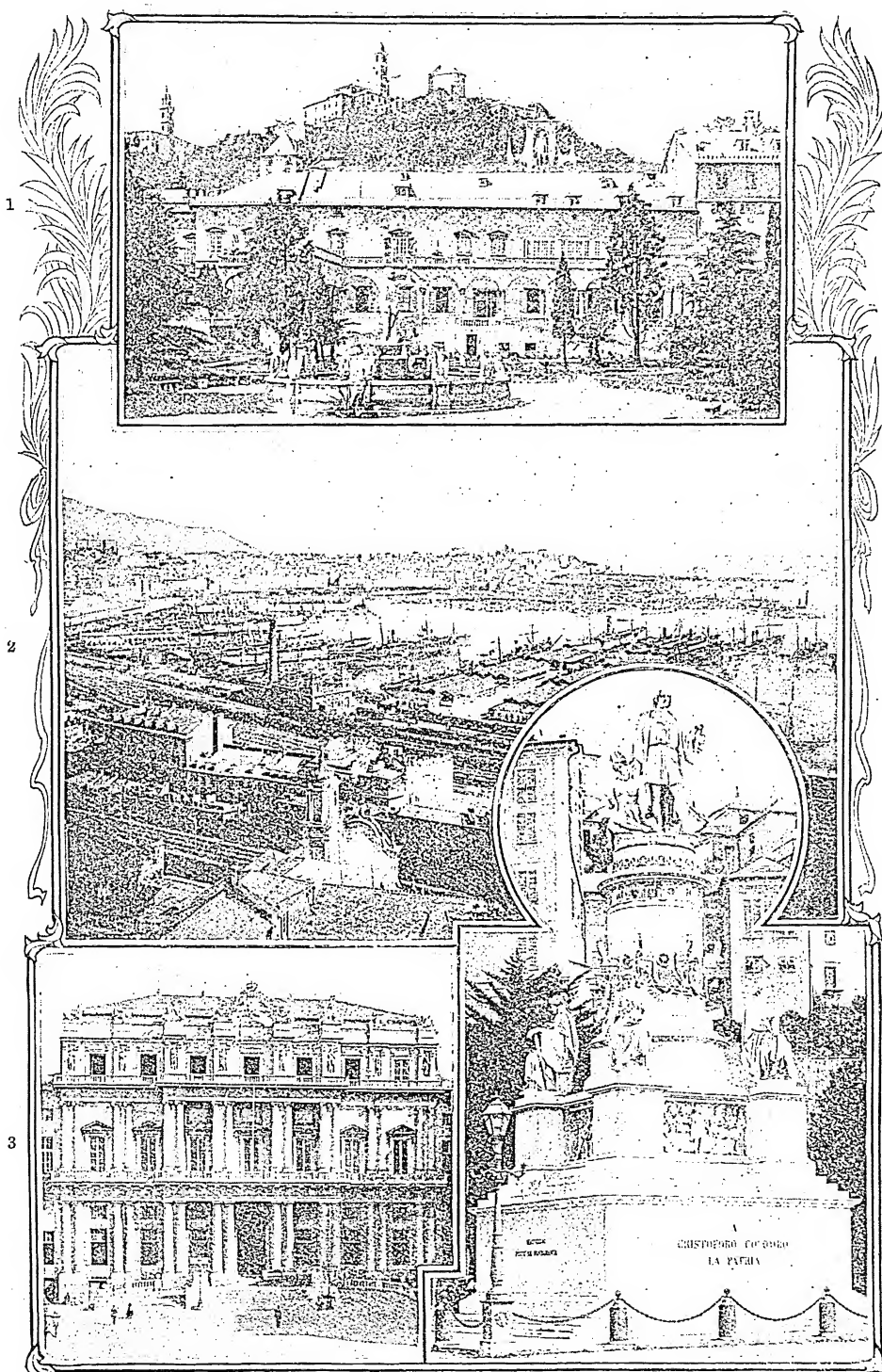
Gennesaret. See GALILEE, LAKE OF.



Lake of Geneva.

is 45 m., its maximum breadth 9½ m., and its total area 225 sq. m. The Rhone enters it as a turbid, muddy stream at the N.E. end, and leaves it limpid and azure at Geneva, and the silt thus deposited is continually diminishing the lacustrine area. The greatest depth is 1,017 ft., its surface being 1,220 ft. above sea-level. It is subject to sudden rises and falls of surface, sometimes of 2 to 5 ft. in the course of thirty minutes, due to alterations of atmospheric pressure, known as *seiches*. Among the towns and historical resorts on its shores, which attract both tourists and winter residents, are Coppet (the home of Madame de Staël), Ferney (the château of Voltaire), Nyon, Morges, Ouchy (the port of Lausanne), Vevey, Montreux (with its view of the valley of the Rhone, the Dent du Midi in the background), Territet (the steamboat station for the

trality of ambulances and military hospitals and the persons employed therein, even after occupation by the enemy. The equipment of military hospitals is subject to capture, but ambulances retain their equipment. Inhabitants of the country who bring help to the wounded shall be respected; the presence of a wounded man brings protection to a house, and any inhabitant who has entertained wounded men is exempted from quartering of troops and payment of war contributions. Wounded or sick soldiers shall be taken care of, to whatever nation they may belong, or may be delivered at the outposts of their army; those who are recognized as incapable of serving shall be sent back to their country, and others may be sent back on condition of not serving again during the war. A distinctive flag with a red cross on a white ground shall



Views in Genoa.

1. Gardens of the Palazzo Doria Pamphili. 2. General view from the Villa Rosazzo. 3. The Ducal Palace.
4. Monument to Christopher Columbus.

Genoa. (1.) Province of Italy, between the N. Apennines and the Ligurian Sea, or Gulf of Genoa. It embraces the coast tract of the Riviera, which enjoys a mild and excellent climate, and produces abundance of fruit. The people are good seamen, and ship-building, iron-working, and textile manufactures are carried on. Area, 1,582 sq. m. Pop. (1901) 934,627. (2.) Ital. *Genova*, archiepisc. city, seapt., and fort. pl. of Italy, chief tn. of above province, at the head of the Gulf of Genoa, 94 m. by rail s. of Milan. It consists of an old town with short, narrow streets, encircled by new quarters with broad, open thoroughfares, and climbs up the steep hillside overlooking the sea. Great improvements were effected during the last thirty years of the 19th century. Among its handsome, palatial buildings, in the renaissance style, are the 16th century municipal palace; the Palazzo Rosso and Palazzo Bianco (1565-9), now picture galleries; and the Palazzo Spinola. Farther towards the N.W. are the magnificent church of the Annunciation (1587); the Palazzo Durazzo-Pallavicini, also with an important picture gallery; the Palazzo Balbi-Senàrega (17th century); the 17th century royal palace; and the Palazzo dell' Università, begun as a Jesuit college in 1623, and transformed into a university by Napoleon in 1812, and now attended by about 1,400 students. Still farther in the same direction are the school of navigation, the arsenal, and the spacious palace of the Doria family, presented to them by the city in 1528. The imposing ducal palace is a pile of the 15th and 16th centuries, and the cathedral was founded in 985, restored in 1896, and contains a fine chapel of St. John the Baptist (1449-96). Still farther to the s. stands the beautiful church of Santa Maria di Carignano (1552-1603). The church of San Stefano contains one of Giulio Romano's best pictures, *The Stoning of St. Stephen*. The harbour, which has been very greatly enlarged by the construction of a gigantic break-water since 1877 and 1897, extends to 550 ac.; a small portion is set aside as a free port. The total trade amounts to £36,630,000 annually (imports, £20,800,000; exports, £15,830,000). Besides being the principal commercial port of the kingdom, Genoa is also one of its busiest industrial centres. The enlargement of the port, at an estimated cost of £2,000,000, is now being proceeded with, in view of the expected great increase of trade through the opening of the Simplon tunnel. The chief branches of activity are shipbuilding, iron foundries and

iron works, sugar-refining, tanning, cement-making, the manufacture of cotton, macaroni, ornaments for personal wear, preserved fruits, etc. Pop. (1901) 234,710. During the 11th and 12th centuries Genoa grew into a powerful maritime state, and not only took part in the crusades, but established settlements in the Levant and even in the south of Russia. As a sea power Genoa crushed her first great rival (Pisa) in 1284 at Molaro, but was herself crippled by her second great rival (Venice) in the naval battle of Chioggia (1379). Then, after being alternately a dependency of France and Milan, Genoa placed herself (1528) under the protection of the Emperor Charles V., though the real power rested with Andrea Doria down to his death in 1560. Genoa's friendship with Spain caused her to incur the wrath of Louis XIV. in 1685, and in 1746 she felt the still sterner vengeance of Austria. Latterly she shared the destinies of the kingdoms of Savoy and Italy. (3.) GULF OF, large opening to the N. of the Ligurian Sea, Mediterranean, about 90 m. broad at its widest part, between Spezia on the E. and Oneglia on the W.

Genre Painting is held to signify familiar scenes of rustic or domestic life, and all homely figure subjects not coming under the name of 'historical.'

Gens, in ancient Rome, denoted those persons who claimed descent from a common ancestor, and who bore a common name. Of the three names borne by every Roman, the name-in-chief, which was the middle name, was that of his *gens*—for example, Gaius Julius Caesar and Marcus Tullius Cicero belonged respectively to the Julian and Tullian *gentes*. There were three hundred *gentes* in the state. At first only patricians were counted as belonging to the *gentes*, but afterwards plebeian *gentes* appear. See FAMILY, TRIBE.

Gensan, or GÜNSAN. See WÖNSAN.

Genseric, king of the Vandals from about 429 to 477 A.D. In 429 he invaded Africa, and finally took possession of all the Roman provinces, capturing Carthage in 439. In 455 he seized Rome, and sacked it for fourteen days. (See VANDALS.) He was an Arian, and persecuted orthodox Christians ruthlessly.

Gent, Belgium. See GHENT.

Gentian, a genus of hardy plants belonging to the order Gentianaceæ. They have a bitter taste, and one species, *G. lutea*, is largely used as a bitter tonic in medicine. Gentians are not easy plants to establish in a garden, on account of their need of root moisture and their dislike of root

disturbance. It is best to raise them from seed. A deeply-dug soil containing stones and peat should be selected, and an open position is desirable. The two species best worth cultivating are the little *G. verna* and the old gentianella, *G. acaulis*, both bearing flowers of the purest blue.



Gentian (G. acaulis).

Gentile da Fabriano. See FABRIANO.

Gentiles, a name applied in Scripture to the non-Israelite nations; it came, particularly after the exile, to carry the disparaging sense of 'heathen.'

Gentilly, s. suburb of Paris, 2½ m. s. of Notre Dame, dating from the 6th century. There are quarries, brick works, chemical works, potteries, and tanneries. Pop. (1901) 7,433.

Gentleman (Fr. *gentilhomme*), one of gentle birth and conduct, having the right to armorial bearings, but below the grades of nobility; an order that began to exist as a separate class, according to Freeman, early in the 11th century. Popular usage has extended the name to all men of chivalrous character, and it should 'never,' says Steele, 'be affixed to a man's circumstances, but to his behaviour in them.' In law the term has been judicially defined as 'a person who has no occupation.'

Gentleman's Magazine, THE, first saw the light in 1731 as 'a monthly miscellany.' Edward Cave, its first manager, showed almost modern enterprise in reproducing portraits and engrav-

ings, and in offering prizes for poetry. In 1738 Dr. Johnson began to contribute, and for years he composed 'reports' of the debates in Parliament. The character of the publication was changed in 1868 to its present form, the only original feature remaining being the style of the editor—'Sylvanus Urban.'

Gentlemen-at-Arms. The Honourable Corps of Gentlemen-at-Arms originated in the 'King's Pensioners and Spearmen,' a body formed in 1509 out of the cadets of noble families by Henry VIII. as a mounted guard to his person. The corps is paid out of the privy purse, and consists of one captain (who must be a peer), one lieutenant, one standard-bearer, and one clerk of the cheque and adjutant, and one sub-officer—all of whom must be, or have been, lieutenant-colonels or colonels; forty gentlemen—all above the rank of captain, active or retired, of the army and marines. The corps attends all important court and state functions. The captain of the corps changes with the ministry.

Gentz, FRIEDRICH VON (1764-1832), Prussian statesman and publicist, born at Breslau. In 1794 he translated Burke's *Essay on the French Revolution*. A visit to England led to lasting intimacies with Mackintosh, Pitt, Grenville, and other politicians. Entering the service of the Austrian government (1802), in 1814 he was appointed first secretary to the Congress of Vienna, performing corresponding duties at the conferences of Paris (1815), Aix (1818), and others, down to that of Verona (1822). Though often inconsistent, and accused by many of selling his pen to the highest bidder, he was firm in his opposition to Napoleon. Among his publications are *War between Spain and England*, and *Fragments upon the Balance of Power in Europe* (1806). See *Lives*, in German, by Karl Mendelssohn-Bartholdy (1867) and Schmidt-Weissenfels (1859).

Genus, in biological nomenclature, is a group of similar species, while a group of similar genera constitute a family. No hard and fast line can be laid down as to whether a group of related animals or plants should be placed in one or in several genera, but in all cases the characters which distinguish one genus from another must be greater than those distinguishing the species of the genera. For example, the large genus *Canis* (dog) includes the domestic dog (*Canis familiaris*), the fox (*C. vulpes*), the wolf (*C. lupus*), and so on. All these have, among other common characters, five toes on the fore foot, and four

on the hind. The Cape hunting dog has only four toes on the fore foot, and on account of this and some other characters is made the type of a distinct genus, *Lycan*. Only rarely are genera distinguished from one another by one character only; generally there is a combination of distinguishing characters.

Genzano, tn., Italy, prov. Rome, on the Alban Mts., 22 m. S.E. of Rome. Pop. (1901) 7,376.

Geocentric, a term used in astronomy for an orbit having the earth for its centre. The geocentric system was built on the ancient theory that the earth was the centre of the planetary system. The geocentric latitude of a planet is its distance from the ecliptic as seen from the earth, and its geocentric place is that wherein it appears to us from the earth. The term is distinguished from heliocentric.

Geodes, in mineralogy, are cavities lined with crystals. (See **DRUSY CAVITIES**.) They are of many kinds; some are concretionary, like hollow flints or cherty nodules in limestone, others are hollows in joints of rocks, others are steam cavities in igneous rocks lined with crystals of secondary minerals.

Geodesy, a term employed for the determination of the form and dimensions of the earth, or of large areas of it. With the conception of a spherical earth arose the possibility of determining from the positions of two places and the shortest distance between them the dimensions of the sphere. This was carried out by Dichæarchus (fl. 320 B.C.), and later by Eratosthenes (c. 275-195 B.C.), who, taking Syene (Aswan) and Alexandria as the two points, and assuming that both were on the same meridian, and that Syene was on the tropic of Cancer, determined by the gnomon at midsummer the altitude of the sun at Alexandria, and estimating the distance between the two places, calculated the length of the earth's circumference. His result probably gave a close approximation to the true dimensions, in spite of the incorrect data used. Ptolemy (150 A.D.), in calculating the size of the globe, accepted the smaller and less accurate figures given by Hipparchus. Two parties of Arabian mathematicians measured 1° north and south of a starting point on the plains of Sinjar (Singara) for Caliph Al-Mamun in 819. The results of Copernicus, Galileo, Kepler, and Newton, and the invention of better instruments, led to more accurate work. The Dutchman Snell applied in 1615 the principle of triangulation, which permits a short base measured

under favourable conditions to be extended by angular measurements and calculations, so that great distances over uneven ground can be computed with accuracy. One great weakness of this method was overcome when Picard used (1669-70) the telescope and cross lines in measuring angles. Picard also showed that it was unnecessary to measure along the meridian, as all lines could be projected on it.

In 1672, Richer, a French astronomer, visited Cayenne, in French Guiana, and noticed that a clock which kept good time in Paris lost 2 min. 28 secs. a day at Cayenne, and that the pendulum which beat seconds had to be shortened 1½ lines. This suggested to Huygens not only that the influence of the so-called centrifugal force, due to terrestrial rotation, diminished the effect of gravity, but that the earth must bulge at the equator; and Newton calculated that the equatorial axis was 1½ longer than the polar axis. Actual measurements of arcs were attempted by Fernel before the days of Snell, and after him by Picard. The Cassinis measured two arcs from bases at Perpignan and at Dunkirk, with the result that the lengths of a degree seemed to diminish to the north, and therefore that the earth must be prolate—not oblate, as the Newtonian theory demanded. To the French Academy belongs the credit of equipping expeditions which were to settle the problem. Under Bouguer, De la Condamine, and Godin, an arc was measured in what is now Ecuador, then Peru, which gave 56,753 toises to 1° according to De la Condamine, and 56,749 according to Bouguer. Under Maupertuis and Clairault, aided by Celsius, another was measured in Lapland, which gave 57,438 toises to 1° in lat. 66° 20'. The earth approximated to an oblate spheroid.

The work of the various national land surveys has given new data. Under the energetic directorship of Von Bueyer, who assisted Bessel in the early days of the Prussian survey, a European, and later an International, Geodetic Association was founded (1861-95), and in its proceedings will be found the weightiest of recent results. Lately, the arcs are being re-determined and extended in the historic lands of Ecuador (since 1901), Lapland, and Spitzbergen (since 1899), although not all the positions of the old bases have been found. At the present time great arcs have been measured in America, Europe, India, and Japan, and progress is being made with one which will extend from the Cape to the Nile delta.

The operations of geodesy consist of determining the length, azimuth, position, and altitude of a base-line, usually a few miles long, the ends of which are visible each from the other, and between which the ground is level. Transit instrument and theodolite may be used for the angular and time observations, and rods or wires for measurements of length. The instruments used must be of the most delicate accuracy, and all the necessary corrections for refraction, instrumental errors, etc., applied. The measuring rods or wires should be compensated for changes of temperature, properly levelled, kept from sagging, adjusted by micrometer screws, and read through microscopes. Special steel tapes may be used in all but the finest work. A theodolite is employed to direct the alignment of the rods or tapes. The lengths have to be reduced to sea-level. The positions of the terminal points of the base and its azimuth are determined, while bearings are taken to prominent objects, natural or artificial, which form the angular points of the first triangles; from which, by similar observations, new triangles are obtained, until a network, either of interlaced or of successive primary triangles, is obtained. From this is calculated the length of a meridian arc, the position of whose ends is precisely determined.

The standard works are Colonel Clarke's *Geodesy* (1880), and H. Helmert's *Die mathematischen und physikalischen Theorien der höheren Geodäsie* (1884). Useful practical chapters are to be found in H. M. Wilson's *Topographic Surveying* (1900), and also in Middleton, Chadwick, and Bogle's *Treatise on Surveying* (2 vols. 1902). A readable book is J. H. Gore's *Geodesy* (1891).

Geodorum, a genus of East Indian terrestrial orchids, with tuberous roots and pendulous spikes of flowers. They require stove temperature and a peaty soil.

Geodynamics, the branch of science that deals with the forces which act on the earth's surface and bring about transformations, whether rapid or slow. It has also been termed geophysiography, and is used in contrast to geomorphology, which deals with the shapes of the successive transformations. The movements of the earth and on the earth may be grouped as (a) gravitational, (b) translational, (c) rotational, and (d) vibrational. (a) coupled with (b) produces the revolution of the earth in its orbit; (a), (c), and (d) all condition movements on the earth's surface itself, as well as of the whole globe. We

may classify the source of energy (1) as pertaining to the earth itself, as witnessed by its rotation, its onward motion in its revolution, and the internal stores of energy (electrical, thermal, chemical), the presence of which is revealed in volcanic phenomena; (2) as derived from the relations with external bodies, whether these be gravitational or vibrational. It may be possible to see in them various manifestations of one source of energy. At present it is expedient to examine them separately. When sun and earth

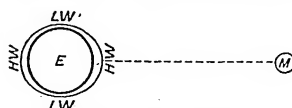


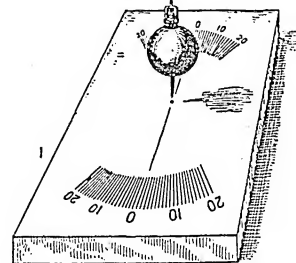
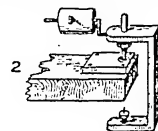
Diagram of the Tides.

E, Earth; M, moon; HW, high water; LW, low water.

are the particles, their mutual attraction, coupled with the translational movement of the earth, produces a rotation about a common centre of gravity, which lies within the sun's mass, so that the earth appears to move in an ellipse round the sun, which has a volume 1,300,000 times, and a mass 332,000 times, as great as the earth. The tides in the fluid layers of the earth are due to solar and lunar attraction. On the earth itself gravity is constantly pulling downwards all particles that are loosened from the grip of molecular forces, which attract them to the main solid mass—down being used in the sense of towards the earth's centre of gravity. Gravity tends to smooth inequalities at the earth's surface, though it is indeed comparatively smooth, since its maximum and minimum points are only ten and a half miles vertically distant, or about $\frac{1}{25}$ the length of the radius. The great bulk of the land lies between sea-level and half a mile above it, and in this area the force of gravity is almost the same at all points.

Two movements of the earth show that, as a whole, it possesses a store of inherent energy—its rotation and its revolution. The crustal movements, and especially volcanic phenomena, also point to internal energy stores, partly, at least, in the condition of heat. The recurrence of day and night, the apparent motions of the stars in the heavens, the flattening of the earth along its polar axis, the deflection of a particle free to move to the right hand in the northern, to the left hand in the southern hemisphere, are evidences of the earth's rotation. A stone dropped from the eastern side of a very high tower in the northern hemisphere falls

slightly to the east of the tower, owing to its preservation, through its inertia, of the greater speed of rotation at the top of the tower, whence it started. Foucault's pendulum proves the rotation of the earth experimentally by maintaining the plane in which it swings, while that of any line marked on the earth's surface constantly alters relatively to it, except in the plane of the equator. From rotation and revolution we derive the idea of measurement of time. The annual revolution of the earth round the sun takes place in a plane inclined at $67\frac{1}{2}^\circ$ to that of the axis of rotation, which remains constant in its inclination. Only $\frac{1}{220000000}$ of the solar radiations reaches the earth. To these the clear atmosphere is relatively transparent, and they are arrested on the surface of land and sea, where they are partly reflected, partly converted into heat, which affects the soil below to a depth of about twenty feet, tropical waters to ten times that depth, and the atmosphere



Foucault's Pendulum Experiment.

1, The table and pendulum; 2, mode of suspension.

to great altitudes. These are disruptive forces which are counterbalanced by gravity. The daily and seasonal variations in their amount and incidence control the weathering of rocks (sandstone expands $\frac{1}{200000}$ for every degree C. it is heated) and the movement of water—the life-blood of the globe. In conjunction with the down-drawing force of gravity, this determines the vertical and horizontal circulation of water and of air.

For the upward movements of the solid land we have to look primarily to the internal energy of the earth itself, which in its

transformations, whether molecular or molar, causes earthquakes, and tremors, and volcanic phenomena. The raised parts of the crust are acted on by the gravitational and denuding forces, so that a circulation of rock substances, as a rule at a slow rate, has to be considered, as well as a circulation of the water or air, both of which are such important agents in the denuding and depositing. See books mentioned under GEOMORPHOLOGY.

Geoffrey of Monmouth (?1100-1154), Welsh monk and chronicler, chaplain till 1128 to William, Count of Normandy, and subsequently bishop of St. Asaph (1151). He was the author of the *Historia Regum Britanniae* (ed. Schulz, 1854), which gave so great an impulse to the formation of the Arthurian literary cycle. According to Geoffrey's own statement, he found the material for his history in a book brought by Archdeacon Walter Mapes of Oxford from Brittany, which he, at the archdeacon's request, translated into Latin; but internal evidence shows clearly that the real foundation for the work was Nennius's *Historia Britonum*. Besides the *History*, Geoffrey wrote *Prophetia Anglicana Merlini* and *Vita Merlini* (ed. Fr. Michel, 1837).

Geoffrin, MARIE THÉRÈSE (1699-1777), born at Paris; drew around her in Paris a number of shining lights in philosophy and literature, among them Hume, Gibbon, Montesquieu, D'Alembert, Morellet, Thomas, and Stanislas Poniatowski. After the last-named had become king of Poland, he received (1766) Madame Geoffrin with high honours, as did Maria Theresa and her son, Joseph II., at Vienna. She contributed liberally to the *Encyclopédie*. Her work, *Sur la Conversation*, and her *Lettres* were published by Morellet. See *Eloges de Madame Geoffrin*, by Thomas, D'Alembert, and Morellet (1812); *Madame Geoffrin, her Salon and her Times*, by J. Aldis (1905); and *Correspondance Inédite du Roi Stanislas Auguste Poniatowski et de Madame Geoffrin, 1764-1777* (ed. C. de Mony, 1875).

Geoffroy Saint-Hilaire, ETIENNE (1772-1844), French naturalist, born at Etampes (dep. Seine-et-Oise). Appointed in 1793 professor of zoology at the Museum of Natural History in Paris, his work was interrupted (1798) by a journey to Egypt in connection with Bonaparte's scientific expedition. He became professor of zoology in the Faculty of Sciences (1809), and published *Philosophie Anatomique* (1818-20), *Sur le Principe de l'Unité de Composition Organique*

(1828), and *Philosophie Zoologique* (1830). The principle which he maintains is that of the unity of all organic composition—the point on which his celebrated controversy with Cuvier turned. See *Life*, in French, by his son (1847); also *Cuvier et Geoffroy Saint-Hilaire* (1890), by Ducrotay de Blainville.

Geoffroy Saint-Hilaire, ISIDORE (1805-61), French naturalist, son of the preceding, born at Paris, acted as assistant to his father. Sent to organize a faculty of sciences at Bordeaux (1838), he became professor of zoology there. Appointed inspector-general of the university at Paris (1844), he became also professor of zoology to the Faculty of Sciences (1850). He was the founder (1854) and president of the Acclimatization Society in Paris. Among his works are a *Life* of his father (1847); *Histoire des Anomalies de l'Organisation chez l'Homme et les Animaux* (1832-7); *Essais de Zoologie Générale* (1841); and *Histoire Naturelle Générale des Règnes Organiques* (1854-62), unfinished.

Geographical Distribution.

(1.) **ANIMALS.**—If we consider the inhabitants of any particular region of the earth's surface, we find that, with rare exceptions, neither plants nor animals are uniformly distributed throughout the area in which they occur. All organisms are adapted to certain environmental conditions, and in the general case the distribution of these conditions determines the distribution of the organisms. On the other hand, animals are often absent from countries that are perfectly suited to their habits. The primary reason for the want of uniformity in distribution is to be sought in the existence of barriers to the migration of land animals. Thus the range of the Himalayas prevents to a large extent the passage of animals either from or to the south, whence we have the marked distinction between the fauna of India and that of Asia north of the Himalayas; the desert of Sahara similarly cuts off the fauna of the greater part of the African continent from that of Europe and Asia; the great island and continent of Australia is cut off by the ocean from all communication with the rest of the animal world, save such as can cross the sea by swimming or by flight. Other barriers of minor importance are climate, large rivers, humidity, and so on. By such barriers the surface of the earth is more or less distinctly marked off into regions, each characterized by its own group of animals. It is chiefly by the distribution of the land mammals that these regions have been defined.

The simplest scheme, and that adopted by Dr. A. R. Wallace, recognizes the following six regions:—

(1.) The Palaearctic, including Europe, temperate Asia, Africa north of the Atlas Mountains.

(2.) The Ethiopian, including Africa south of the Atlas Mountains, with the island of Madagascar.

(3.) The Oriental, comprising India south of the Himalayas, Further India, Southern China, Sumatra, Borneo, Java, and other islands of the Malay Archipelago as far south as Bali.

(4.) The Australian, comprising the continent of Australia, with New Guinea, Celebes, Lombok, and the islands of the Pacific.

(5.) The Nearctic, including N. America as far south as Mexico.

(6.) The Neotropical, including Central and S. America, with the W. Indies.

This classification fails in many respects adequately to mirror our present knowledge of geographical distribution. Thus the faunas of Australia and S. America are each of an exceedingly peculiar and isolated nature, and yet in the preceding scheme they have no higher rank than the Nearctic and Palaearctic regions, which very closely resemble one another as regards their animal population. Again, a study of recent and fossil mammals has shown that certain orders or groups have evolved in special regions of the earth, there alone have reached full development, and from these 'centres of dispersion' have spread to a greater or less extent over other parts of the globe. The following scheme, based upon these facts, is taken from Lydekker's *A Geographical History of Mammals* (1896), in which a historical account of the different schemes proposed will be found.

(1.) *Arctogæic Realm*, including Europe, Asia with India, Africa, N. America, and divided into the following regions:—

(a) Holarctic region, which includes the Palaearctic and Nearctic regions as defined above, except that Lower California and parts of Mexico are separated from the Nearctic region; (b) Oriental region as defined above; (c) Ethiopian region as defined above, with the exception of Madagascar and the neighbouring islands, which are included in (d) the Malagasy region. Similarly, the southern part of the Nearctic region is separated off as a distinct (e) Sonoran region.

(2.) *Neogæic Realm*, including only the Neotropical region as defined above.

(3.) *Notogæic Realm*, including Australasia, with the following regions:—

(a) Australian region, with Australia, Tasmania, and New Guinea; (b) Austro-Malayan region, certain islands lying between New Guinea and Bali; (c) Polynesian region, New Zealand and certain of the islands of the Pacific from which the Sandwich Islands and some others are separated, as the (d) Hawaiian region.

In the Holarctic region we have among mammals, marmots (*Arctomys*), beavers (*Castor*), reindeer (*Rangifer*), bison (*Bison*), elk (*Alces*), glutton (*Gulo*), sheep (*Ovis*), bear (*Ursus*); while the Nearctic sub-region has such

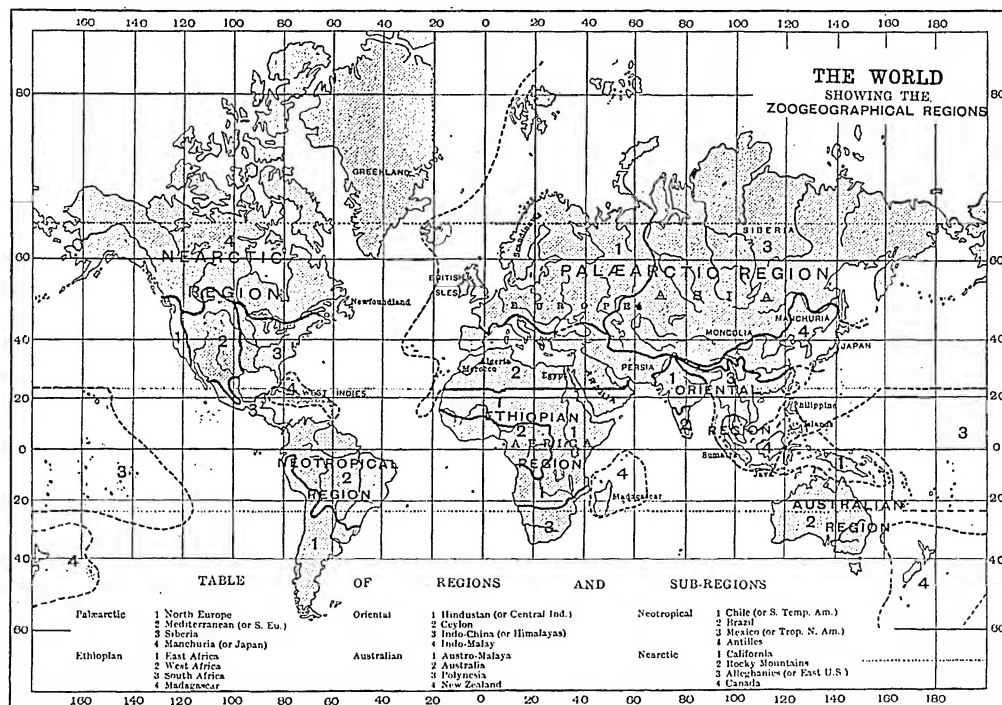
elephant, hippopotamus, giraffe, rhinoceros, zebra; a host of antelopes; lion, leopard, panther, and other carnivores; lemurs, monkeys, and anthropoid apes (gorilla and chimpanzee); *Hyrax*; aard-vark, turacos and plantain-eaters, sun-birds, bee-eaters, weavers, chameleons, many vipers, crocodiles, lung-fish (*Protopterus*), and two ganoids.

In the Malagasy region we have a great development of lemurs, the civet-like *Cryptoprocta*, the hedgehog *Centetes*, while numbers of the typical African mammals are absent.

In the Sonoran region there is

the Austro-Malayan region there is an intermixture of Australian and Oriental types. In the Polynesian region there are practically no non-flying mammals, save a mouse (possibly introduced) in New Zealand, and the gray cuscus and four mice in the Solomon Islands. The Hawaiian region, equally devoid of mammals, is entitled to be regarded as distinct on account of its birds.

While in birds the power of flight always leaves a possibility of migration from one land surface to another, and while reptiles, as adults or as eggs, may be passively transmitted across ex-



Geographical Distribution of Animals.

peculiar forms as the prongbuck (*Antilocapra*), the skunk (*Mephitis*), the raccoon (*Procyon*). Many birds and fish are common to the two sub-regions, which are indeed closely related.

In the Oriental region we have pangolins, many deer, chevrotains, cattle, pigs, a tapir, elephant, rhinoceros, civet, hyæna; many large cats—e.g. tiger, leopard, panther, etc.; many mice, squirrels, and bats; monkeys, and anthropoid apes (gibbon and orang); many pheasants, hornbills, coral-snakes (*Elapidæ*), crocodiles, and so on.

In the Ethiopian region we find a multitude of large ungulates—

a certain mingling of Nearctic and Neotropical forms.

In the Neotropical region we have sloths, armadillos, and ant-eaters, the llamas and their allies, tapir, peccary, an enormous number of rodents, no horse, sheep, goats, nor antelopes, Cebidæ or New World monkeys, marmosets, opossums, humming-birds, and many other peculiar birds, alligators, crocodiles, iguanas, many frogs, the lung-fish (*Lepidosiren*), and so on.

The Australian region is characterized by the great development of marsupials or pouched animals, and the exclusive possession of the monotremes. In

paneses of sea in floating logs, etc., it seems impossible that land mammals should extend from one continent to another save by means of a land-connection. Further, as mammals are of geologically recent origin, their distribution affords a basis for deductions as to the recent changes in the distribution of land and water on the surface of the earth.

We have hitherto been concerned entirely with the distribution of terrestrial animals, but aquatic forms can also be divided according to the nature of their special habitat. Thus, one would distinguish between marine and

fresh-water animals in the first place; and in the case of the marine forms it is possible to distinguish between a *littoral* fauna, including animals adapted for life near the margin of the land—i.e. shore animals in the wider sense; a *pelagic* fauna, including the forms adapted for life in the open sea; and an *abyssal* fauna, including those which live only in the great depths. See A. R. Wallace's *Geographical Distribution* (2 vols. 1876), and *Island Life* (1880); A. Heilprin's *The Distribution of Animals* (1887); P. S. Beddard's *A Text-book of Zoogeography* (1895).

(2.) **PLANTS.**—One of the earliest references in the English language to the distribution of plants and animals occurs in Gilbert White's fortieth letter to Pennant. He says that Linnaeus ranges plants geographically: palms inhabit the tropics, grasses the temperate zones, and mosses and lichens the polar circles. A much fuller account of the opinions of Linnaeus on the subject is to be found in the *Amoenitates Academicæ* (1749-90), ii. 439-599. Accepting a single centre of creation, he accounts in a natural manner for the distribution of plants over the surface of the globe. There is a reference to the multitude of seeds produced by some plants; and among the natural agencies for dispersal are instanced wind, rain, and currents; and his theory of the power of seeds to survive long immersion was independently established by the experiments of Darwin and Martens, which are described in the *Origin of Species*, ch. xii. The pappus of composites and hooked seeds are included, and after a reference to human agency, that of birds and beasts is dealt with—notably the passage of seeds uninjured through the digestive organs of both, the hoards of the squirrel, etc.

Alexander von Humboldt comes next, and Drude claims that he has the same right to be considered the founder of botanical geography that Darwin has to be reckoned as the founder of the theory of descent. Humboldt seems to have been the first to suggest the value of distributional maps. Climate and soil were the factors on which he laid the chief stress.

In 1823, J. P. Schouw, a Danish botanist, divided the earth's land-surface into eighteen kingdoms, some of which were subdivided into provinces. A few had geographical names, though most were designated from the characteristic flora, which was necessarily the criterion. His first kingdom was that of saxifrages and mosses (the Alpine-Arctic

flora); his sixth and eighth kingdoms were named respectively from the magnolia and the cinchona. A few years later Meyen put forward his scheme of zones, adopting parallels of latitude as boundary lines. His scheme is given in Henfrey's *Elementary Botany* (1857; 4th ed. 1884), but isotherms have been substituted for the mathematical boundaries. His zones were:—

(1.) *Equatorial*, extending for 15° on each side of the equator; marked by extreme luxuriance, and forming the tropical forest belt; the region of palms and bananas.

(2.) *Tropical*, extending north and south from 15° to the tropics. The vegetation is closely allied to that of the Equatorial zone, but with tree-ferns and figs.

(3.) *Sub-tropical*, from the tropics north and south to 34°. The vegetation is green throughout the year; the most striking characteristics are the magnolias, laurels, and myrtles.

(4.) *Warmer Temperate*, the space in each hemisphere between 34° and 45° of latitude. The general characteristic is the occurrence of magnolias and trees of similar foliage with the forest trees; a few palms occur as outliers from the subtropical zone.

(5.) *Colder Temperate*, from lat. 45° to lat. 58°, marked by forests of deciduous trees, with inconspicuous flowers, intermingled with pine and fir woods and grass pastures. In the southern hemisphere this zone is represented only in Patagonia.

(6.) *Sub-Arctic*, extending from 58° N. to the Arctic Circle. The southern boundary marks approximately the limits of the oak in Europe, and beyond the northern boundary few trees occur; conifers abound, giving place northwards to the birch and alder, generally alternating with willows in moist soil; green pastures.

(7.) *Arctic zone*, from the Arctic Circle to 72° N. lat. Characterized by Alpine rhododendrons, dwarf birch, alders, and willows, bog myrtle, sedges, and cotton grass; the grassy pastures of the sub-Arctic zone are replaced to a great extent by lichens.

(8.) *Polar zone*, comprising the region above 72° N. lat.; marked by saxifrages, ranunculuses, and cryptogams.

Meyen's scheme takes no account of the oceanic flora; and from the nature of the case there can be very little land flora in the Antarctic, which will account for his having no southern representatives of his sub-Arctic, Arctic, and Polar zones.

At the meeting of the British Association at Cambridge in 1845, Professor E. Forbes as-

sumed the descent of all individuals of a species either from a first pair or from a first individual, and the consequent theory of specific centres. He accounted for the existence of certain plants in isolated spots by a former land connection of their present habitat with the original centre, and subsequent severance by geological changes, such as the elevation and depression of land. In his view, there were five distinct floras in the British Islands, the derivation of which from the continent could be explained by (1) the existence of a former mountain range stretching across the Bay of Biscay from Spain to Ireland; (2) another barrier from the west of France to the south-west of Britain, and thence to Ireland; (3) a land connection at the eastern end of the English Channel; (4) the partial connection with Norway by a chain of islands in the Glacial sea; and (5) the upheaval of the bed of this sea, uniting Ireland with England, and England with Germany.

De Candolle's geographical grouping of plants was governed by the amount of heat required for their proper development. Those needing a maximum of heat, such as the plants of inter-tropical regions, he called *megatherms*; those of the subtropical and warm temperate zones he styled *mesotherms*; while the names *miotherms* and *microtherms* were employed respectively for the plants of the cool temperate zones and for those that can flourish at very low temperatures. Though De Candolle's scheme has passed out of use, it was applicable to vertical as well as to horizontal distribution. Mountains situated between the tropics possess zones of climate at successive elevations equivalent to horizontal zones between the base of the mountain and the poles.

Grisebach's work was based on the theory of evolution, and is noteworthy for its recognition of the influence of environment in the production of local forms, and the development of these into species.

Engler came to the conclusion that the most extensive changes in the vegetation of a given region corresponded to geological changes. According to his view, as far back as the Tertiary period there were four 'floral elements' to be distinguished; and though exchange of plants might have taken place between one region and another not far removed, there must have been wide areas from the greater part, if not the whole, if any given element was absent. His 'elements' were:—

(1.) *Arcto-Tertiary*, distinguished by abundance of coni-

fers, and many genera of trees and shrubs which are now predominant in N. America, Europe, and that part of Asia lying north of the tropic of Cancer. In the region covered by this flora there must have existed several zones, and in proof of this he instances the former predominance of conifers in the north of Greenland and Spitzbergen. He considered that De Candolle's mesotherms belonged to this flora.

(2.) *Palaeotropical*, marked by certain families formerly dominant in the tropical region of the eastern hemisphere, and by the absence of families characteristic of the Arcto-Tertiary element. Groups like the saxifrages, now only occurring within the tropics in the higher mountain regions, must have been wanting, this flora, corresponding to the megatherms of De Candolle, from the south of England to Japan, and from W. Africa to New Guinea and Australia.

(3.) *Neotropical* or *S. American*. This flora must have had the same characteristics as that of tropical Brazil and the W. Indies at the present time. Before the elevation of the Andes it must have spread nearly over the continent; but later, forms from the Arcto-Tertiary element intruded into the mountain regions.

(4.) *Old Oceanic* element, composed of plants capable of distribution across intervening stretches of water, and of development on islands and island-groups.

Corresponding to these four divisions of the Tertiary flora, Engler instituted four kingdoms, with certain primary divisions, further subdivided into provinces and zones:—

(1.) *Northern Extra-tropical*, with nine divisions: Arctic, Sub-Arctic, Central European and Aralo-Caspian, Central Asiatic, Micronesian Islands, Mediterranean, Manchu-Japanese, Pacific N. America, and Atlantic N. America.

(2.) *Palaeotropical*, with ten divisions: W. African, Afric-Arabian, Malagasy, Further Indian, Tropical Himalayan, E. Asian, Malayan, Araucanian, Polynesian, and the Sandwich Islands.

(3.) *South American*, with five divisions: The Mexican Highlands, Tropical American, Andean, the Galapagos, and Juan Fernandez.

(4.) *Oceanic*, with eight divisions: The Antarctic forest region of S. America, New Zealand, Australian, Kerguelen, Amsterdam Islands, the Cape, Tristan d'Acunha, and St. Helena.

Drude was content with three main groups, and his primary divisions were fewer than those of Engler. His scheme was:—

(1.) *Boreal group*, with five divisions: Northern, Inner Asiatic, Mediterranean, E. Asiatic, and Central N. American.

(2.) *Tropical group*, with four divisions: Tropical African, E. African Is., Indian (including Polynesia), and Tropical American.

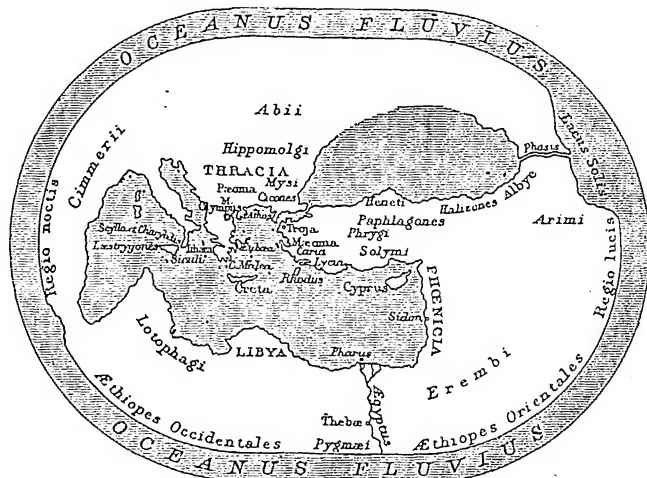
(3.) *Austral group*, with five divisions: South African, Australian, New Zealand, Andine, and Antarctic.

Engler and Drude have more in common than any other two authors referred to, the great difference being the tendency to over-refinement evinced by the former in his subdivisions.

See J. G. Baker's *Elementary Lessons in Botanical Geography* (1875); Hentfrey's *Elementary Botany* (1837; 4th ed. 1884); Darwin's *Origin of Species* (1859); A. von Humboldt and Bonpland's *Essai sur la Géographie des Plantes*

sian Gulf, and the feature lines of Asia Minor, naturally led men to believe in a greater extension east and west than north and south.

Ancient Scientific Geography.—By the time of Eudoxus and Aristotle philosophers accepted the spherical theory of the earth's shape, no doubt in part because of the perfection of the spherical figure, for even then there were not lacking those who believed in the 'perfection' of nature. Aristotle, following Parmenides, extended the ideas of zones of the sphere; and Eratosthenes (276-195 B.C.), using thoroughly sound theoretical conceptions, measured a meridional arc more accurately than Dicaearchus had previously done, and placed reference lines on his maps. Eratosthenes wrote three works, viz.—(1) on historical geography; (2) on mathematical physical geography; and (3) on



The World according to Homer.

(1807); A. de Candolle's *Géographie Botanique* (1835); Engler's *Entwicklungsgeschichte der Pflanzenwelt* (1879-82); Grisebach's *Die Vegetation der Erde* (1884); Drude's *Handbuch der Pflanzengeographie* (1890); and the collection of special monographs on the subject edited by Engler and Drude, under the title *Die Vegetation der Erde* (1896, etc.).

Geography. From early times geography has possessed two different aspects—the one descriptive of diverse countries, the other concerned with the problems of the shape, size, and constitution of the earth. The flat earth was naturally conceived by the Mediterranean peoples as bounded by a circumambient ocean. The axis of the Mid-world Depression, filled by the Mediterranean and Black Seas, the Mesopotamian Plains and the Per-

descriptive geography, with data for a map. These have unfortunately been lost, but parts are known through Strabo. The measurement of the earth's circumference marks the culmination of the first stage of the evolution of geographical conceptions. (See GEODESY.) The universe was no longer topocentric, but geocentric. The subdivisions of the world, too, received attention, but no sound systematic knowledge of configuration was evolved, while that of climate was expressed in the climata or belts of latitude of Hipparchus (fl. c. 140 B.C.), to whom we owe the term. Aristotle knew the connection between sea, rain, springs, and streams. Posidonius, the most intelligent of ancient travellers, wrote a work on the ocean; and Pytheas of Marseilles correlated the tides with the phases of

the moon. Early attempts were made to interpret historical facts in terms of geographical facts, especially by Ephorus (first half of 4th century B.C.) and Polybius (c. 204-c. 122 B.C.).

With the growth of Roman power and practical ideals geography took a new trend, and the descriptions of the vast empire became of great national and intellectual interest. What theories were developed came in association with astronomical work, and Ptolemy (c. 150 A.D.) of Alexandria not merely enunciated the theory of the universe, but, using data collected by Marinus of Tyre, gave the position of three hundred and fifty places, only a few of which, however, had been astronomically determined, and made suggestions for an improved cartographical network. Strabo (?63 B.C. to ?24 A.D.) was the outstanding writer of descriptive geography, and his

Cape by Diaz (1486), and the first voyage to India by Vasco da Gama (1498), were events of infinite practical significance; but the first voyage of Columbus across the Atlantic (1492) to what he believed to be the east of the Old World was as much more daring physically as it was intellectually more revolutionary. The coasts of Africa, of Asia, and America, except in the north, were soon known.

The importance of the chart for the mariner resulted in a development of cartography. The New World was first shown on Juan de la Cosa's map of 1500, and it had many successors, that of Caneiro (1502) being the first with degrees of longitude. In 1569 Mercator drew a world map on his now famous projection, and in 1570 Ortelius published a great collection of new maps in his *Theatrum Orbis Terrarum*. Series after

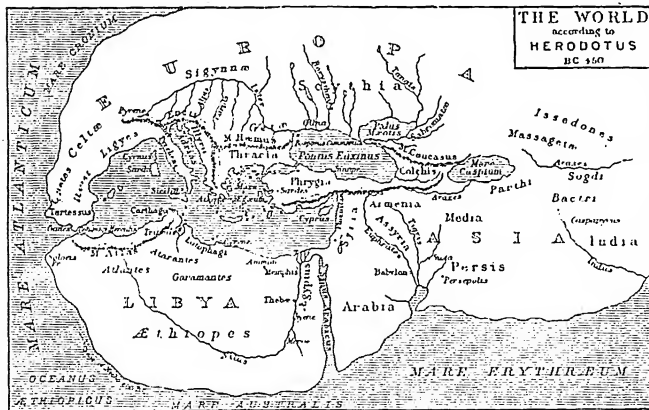
angulation (1615), the use of the telescope, of the pendulum, of the barometer, gave better cartographical data, and resulted not merely in the improvement of the outlines of maps (Delisle, 1675-1726; D'Anville, 1697-1782), but in the representation of relief (*contours*, Buache, 1737; *hachures*, Lehmann, 1799).

The basis of geophysics was prepared more from the physical than from the geographical point of view by the investigation into the relation of the earth to the solar system, gravitation, the tides, and the mean density of the earth, carried on by Newton, Euler, D'Alembert, Leibniz, Laplace, Cavendish, and others. So the studies of rocks, volcanoes, denudation of Desmarest, Werner, Leopold von Buch, and Hutton laid the foundation of a new branch of science—the history and composition of the earth's crust—which was elaborated in Lyell's *Principles of Geology* (1830-3). The works of Linnaeus and his followers undoubtedly promoted geographical botany, of which A. von Humboldt wrote in 1808. In 1778, E. A. W. Zimmerman published his work on the distribution of mammals, and in 1783 he put out the first zoological map of the world; while J. F. Blumenbach distinguished between five races of men in 1775.

The greatest geographer, Alexander von Humboldt (1769-1859), not only assimilated all this new knowledge, but added much to the store by his travels in both the new and old worlds, and by his special investigations. His *Cosmos* (1845-58) is a classic. To him we owe not merely the use of isotherms (1817) and the beginnings of scientific morphology (mean height of the continents, 1843), but also the inspiration of the first great physical atlas (1838-48), associated with the name of Heinrich Berghaus, of which an edition was prepared for Britain by Petermann and Keith Johnston.

His great contemporary, Karl Ritter (1779-1859), has left almost as great an impression on the history of geography. With a sound geographical knowledge and instinct he developed the ideas of Herder (*Ideen*, 1784-91) into a system of historical geography, to which he gave a strong teleological bias. Only the volumes on Asia and Africa of his first *Comparative Geography* (begun in 1817) were completed (2nd ed. 1822-59). These two men profoundly influenced the study of geography, especially in Germany.

Peschel carried on Humboldt's work by his critical history of geography and his posthumous work on physical geography. Most of his successors are still alive.



work contains a summary of the knowledge of the world possessed in the Augustan age.

Medieval Geography.—For thirteen hundred years geography did not flourish in Europe. With the 15th century began the revolution in the conception of the universe involved in the substitution of the heliocentric for the geocentric idea. The spherical shape of the globe suggested not merely the question of what occupied the unknown part of it, but also of new routes to old lands. The stories of the missionary ambassadors in Asia, such as Carpini (1246) and Rubruquis (1253), and more particularly the adventures of Marco Polo (1271-95), increased the knowledge of the Far East, and led to an exaggerated estimate of the extension of the world from east to west, as we can see from Martin Behaim's *Globe* (1492). Italian navigators, whose Mediterranean trade had been checked, took the lead in the new expeditions. The doubling of the

series of travellers' tales were issued, such as those of Francks (1534), Münster (1544), Ramusio (1550), Hakluyt (first ed. 1589).

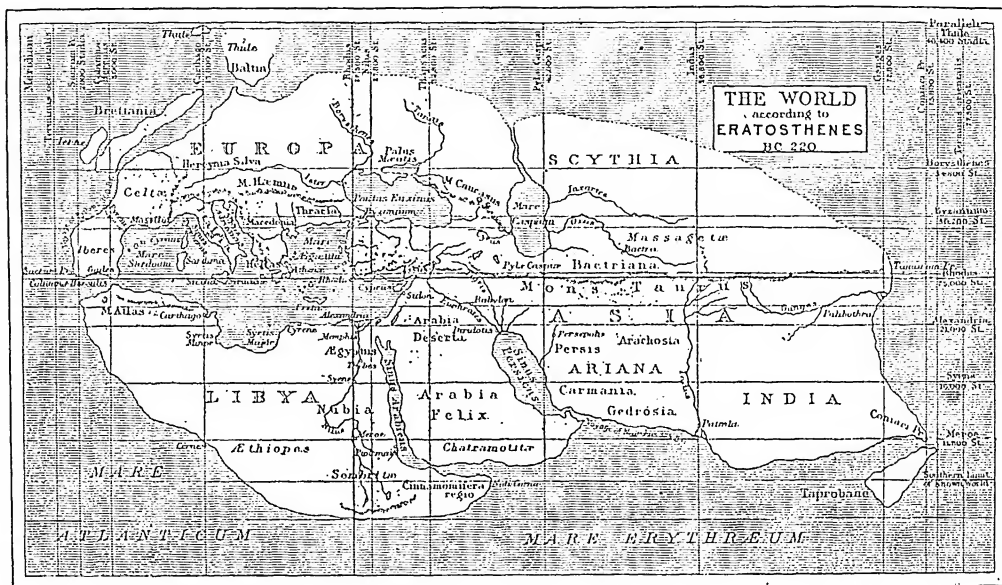
Of general works, those by Peter Apian (*Cosmographicus Liber*, 1524) followed Ptolemy; Sebastian Münster (*Cosmographia Universalis*, 1544) followed Strabo; Philip Cluver (*Introductio in Geographiam Universam*, 1624) distinguished geography from cosmology; and Nathanael Carpenter (*Geography Delineated*, 1625) dealt with principles.

Rise of Modern Scientific Geography.—One book stands out at this early period as a fundamental work—the *Geographia Generalis* of Varenus (1650). Kant lectured on physical geography from 1755, and Torbern Bergmann's *Physical Description of the Earth* appeared in 1766 in Swedish, and was translated into English in 1772. These were the predecessors of Alexander von Humboldt. Better astronomical instruments and methods, the introduction of tri-

and their names are mentioned in the bibliography of this and other geographical articles; and

synthesis. The application of evolutionary ideas has revolutionized geography, which, through

tematic application of scientific methods. It has been affected, too, by the specializing movement.



an advance in the study of physical and natural science, as well as of human history, was a necessary preliminary to a new and fuller

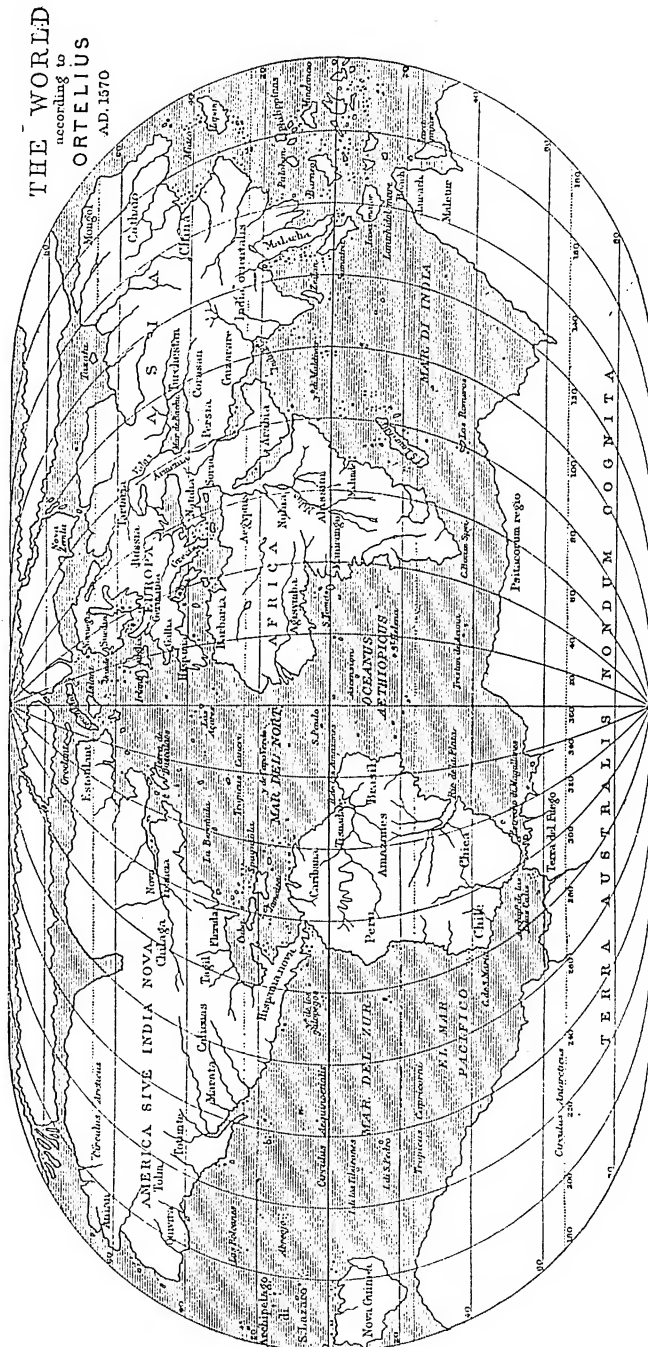
the new data, has gained more connected ways of grouping facts and the powerful means of interpretation afforded by the sys-

Small areas have been minutely studied by one group of geographers, especially in Germany; while the world distribution of

special phenomena, such as volcanoes, glaciers, temperature, selected species of plants or animals, have been investigated by another group of workers.

Scope of Geography.—Until the last quarter of the 19th century in Germany, and the last decade elsewhere, there were few exponents of geography in the universities, and questions of scope and method were seldom discussed. The geographical work and outlook of most of the earlier university teachers of geography were influenced by the subjects in which they themselves had been trained—mathematics, geology, biology, history. Two opposing schools have arisen in most countries—the physical and the historical. This, however, must be looked upon as merely a transition phase, for a geographer must take both into account.

Geography may be regarded as the science of distribution. It is a study of phenomena on the surface of the earth from the point of view of their space relations. It is concerned, not so much with the individual, or with the analysis of the individual into its constituent parts, as with the special interrelations of phenomena within a group, and of different groups of phenomena to each other. Its units are such complexes as a river basin with its various kinds of relief and soils, winds and waters, plants and animals, including man. The configuration forms the relatively stable framework of the geographical unit; climate and drainage are variable, determining the salient features of its biology and anthropology, and after long ages even the configuration. We may term the geographical unit the natural region or macro-organism; and it in turn forms part of a larger complex—the geographical formation. The fundamental data of the geographer are the results of the distributional studies of geologists, meteorologists, biologists, and many others. Starting from these facts, the geographer should compare, combine, and classify, until the different orders and types of natural regions are clearly recognized, and their relationships and distributions understood. This work is only beginning. The data available have, as a rule, not been expressed in a form in which they are of greatest use to the geographer. But the necessary dynamical or physiological classifications are rapidly being worked out, and the geographer is almost in a position to sketch out the main features of a systematic classification—a 'rational system' of natural regions. In his investigations the geographer is hampered by the size of the units



with which he has to deal. He requires a macroscopic rather than a microscopic vision of the world, and his processes are synthetic rather than analytic. Instead of magnifying the phenomena, he has to reduce them to fractions of the natural size.

In considering the subdivisions of geography, we have to take into account (1) world distribution of selected categories of phenomena—e.g. temperature or agriculture; (2) the characteristics and distribution of selected types of geographical formations and regions or macro-organisms, which make up the world—e.g. the Mediterranean region, wherein all categories of phenomena have to be considered. (1.) This may be called *general geography*, and may be subdivided, according to the phenomena considered, into physical, biological, and anthropological, using the last term in its widest significance. Physical geography may be subdivided into the geography of the earth as a whole, and of its layers of land, water, or air; and biological geography into the geography of plants (phytogeography) and of animals (zoogeography). All these may be considered either from the morphological or from the dynamical point of view; but the terms geomorphology and geodynamics are usually restricted to the forms of and movements on the solid surface of the globe. The study of the relationship of the earth to sun and moon, and of the earth's surface, and of the forms which they condition, not necessarily with reference to their distribution, used to be termed 'cosmography.' Kant and Linnaeus employed for this the word physiography, and this was revived by Huxley. Professor W. M. Davis proposes to use the term for the physical environment, and to call the study of the adjustments of organic forms to it ontography. He considers that physiography plus ontography equals geography.

(2.) This may be termed *regional geography* (chorography, some writers call it); it is the special field of geographical work. Starting with a knowledge of (1), the geographer has to determine the regional subdivisions of the earth's surface, taking all factors into account (see *WORLD*), to examine, and as far as possible explain, the adjustments of the internal structure and activities of each natural region, to compare and classify them, or to trace the evolution, distribution, and interrelations of each type. The study of the evolution of terrestrial macro-organisms involves a knowledge of historical or palaeogeography. This term historical geography

must not be confused with the topography of political boundaries of the past, and of military and naval campaigns, which is usually called by this name, but is only a part of palaeogeography. The history of geography may be regarded in two aspects—(a) as the story of the discovery of the earth's surface, mainly by white races, which is a subdivision of human history; and (b) as the history of the development of geographical ideas, which is a part of the history of philosophy.

Of books dealing with ancient geography, Bunbury's *History of Ancient Geography* (2 vols. 1879) and Tozer's *History of Ancient Geography* (1897) are the best works in English. For mediæval geography, Beazley's *Dawn of Modern Geography* (3 vols. 1897-1904) is a comprehensive treatise. The publication of critical editions of old books of travel, more particularly by the Hakluyt Society since 1846, has made accessible a great and varied store of interesting narratives. A summary of geographical exploration has been begun by the publication (1904) of the *Story of Exploration Series*, edited by Dr. J. Scott Keltie.

Vivien de St. Martin's *L'Histoire de la Géographie* (1873) and O. Peschel's *Geschichte der Geographie* (1865; 2nd ed. 1877) are both excellent works. For special periods, Gallois's *Les Géographes Allemands de la Renaissance* (1890), Peschel's *Zeitalter der Entdeckungen* (1858), Kretschmer's *Atlas und text on Die Entdeckung Amerikas* (1892), may be mentioned; and for the discovery of America, the standard works of Harris, Justin Winsor, and Fiske should also be consulted. Nordenskiöld's *Facsimile Atlas and Periplus* (1889) and the series issued by Müller are storehouses of reproductions of old maps.

Of general geographical dictionaries and gazetteers the most complete is Vivien de St. Martin's *Nouveau Dictionnaire de Géographie Universelle* (7 original and 2 supplementary vols. 1879-1900); *The 'Times' Gazetteer*, by G. G. Chisholm (1895; reprint 1899), is the most satisfactory in English; and Ritter's *Geographisches-statistisches Lexikon* (new ed. 1904-5), the chief one in German. *The Statesman's Year-Book*, edited by Keltie and Renwick, is the most authoritative summary in English of current statistics and information about the different states of the world, and the French and German editions of the *Almanach de Gotha* for these languages. For areas and populations, see the successive volumes of the *Bevölkerung der Erde*, issued as numbers of *Petermann's Mitteilungen Ergänzungshefte*, which are most reliable.

Malte-Brun's *Précis de la Géographie Universelle* (1810-29) summarizes the information in the first quarter of the 19th century, as Elisée Reclus's 19 volumes of the *Nouvelle Géographie Universelle* (1875-94) do that in the last quarter. The latter has been translated into English.

Of German works, the 6 volumes of Sievers's *Ländekunde* (1901; 2nd eds. 1901-5) present the most complete scientific summary we possess for each continent, except Europe; for which *Unser Wissen von der Erde* (1896-9), edited by Kirchhoff, is the fullest account. The 7th edition of Wagner's *Lehrbuch der Geographie* (1903, etc.) is also a noteworthy work. Marinelli's *La Terra* (7 vols. 1887-1902) is the chief Italian work. In recent years the revised edition of Stanford's *Compendium of Geography* (1893-1902) affords a somewhat unequal if modern description of the world; while the *Regions of the World Series* (1902), edited by H. J. Mackinder, gives a better proportioned though incomplete account of it; and the *International Geography* (3rd ed. 1903), edited by H. R. Mill, contains a highly condensed summary, mainly of regional geography.

The following general works summarize and interpret our current stock of information: Elisée Reclus's *La Terre* (3rd ed. 1874-76; Eng. trans. by A. H. Keane, 1887); A. Supan's *Grundzüge der Physischen Erdkunde* (3rd ed. 1903); H. Wagner's *Lehrbuch der Geographie* (7th ed. of 1st vol. 1903); Hochstetter and Pokorny in the 1st edition, and Hann, Brückner, and Kirchhoff in the latest edition of the 1st volume of *Unser Wissen von der Erde* (1896-99), and Ratzel's *Die Erde und das Leben* (1901-2). H. R. Mill's *Realm of Nature* (1897) and W. M. Davis's *Physical Geography* (1898) both deserve special mention for their freshness of treatment. Ratzel's *Geographische Handbücher* and the Cambridge Geographical Series are attempts to supply systematic treatises. Chisholm's *Handbook of Commercial Geography* (1903) is the most reliable work on this aspect of geography. Political geography is discussed for the first time in a special treatise by Ratzel in his *Politische Geographie* (2nd ed. 1903).

The Proceedings and Journals of Geographical Societies, and *Petermann's Mitteilungen*, *Die Geographische Zeitschrift*, and *Les Annales de Géographie*, are indispensable periodicals.

Of atlases, that of Stieler is the most authoritative. Debes's *Neuer Hand-Atlas*, Kiepert's *Grosser Hand-Atlas*, and Vivien de St. Martin and Schrader's *Atlas Uni-*

versel are also standard works of reference. The great atlases of Arrowsmith (London), the atlas of Staunford, and of Keith Johnston are still kept up to date and from time to time improved. Andree's *Hand-Atlas* in Germany (*The 'Times' Atlas* it is called in English), Bartholomew's *Twentieth Century Citizen's Atlas*, Schrader, Prudent, and Antoine's *Atlas Modern*, and the *Atlas Vidal Lablache*, each has merits of its own. The maps published in geographical journals must constantly be consulted. Schrader's *Année Cartographique* gives a summary of recent geographical changes. The work of the great national survey need not be detailed in this list. Berghaus's *Physikalischer Atlas*, which appeared in 7 parts (1886-92), is the best cartographic summary of general geography, except such volumes as have been issued of Bartholomew's *Physical Atlas*, which embodies the best maps in, and very greatly amplifies the contents of, the German work.

Geological Survey. The Geological Survey of Great Britain was the first to be instituted, and it was mainly through Sir Henry de la Beche that it was established in the years 1834 and 1835. Other nations rapidly followed suit, and the surveys of the United States, Germany, Canada, France, and Austria now hold a high place.

The functions of such a survey are (1) the publication of geological maps; (2) the issue of printed memoirs explanatory of these maps; (3) the collection of information respecting the geological structure of the country; (4) the study of the natural geological resources of the state, and of the best means of developing them. In some countries, as in the United States, the topographical and geological surveys are united; but in Britain the Ordnance Survey and the Geological Survey are distinct. Frequently the mineral statistics and information relating to mines and quarries are published by the Geological Survey (in Britain by the Home Office). In some countries special agronomic or soil maps are issued (Japan, United States, and Germany), or special publications are devoted to water resources (United States and Great Britain), or to mining developments (most colonial surveys). The Geological Survey of the United States (organized in 1879) gives considerable attention to collecting materials and photographs for educational purposes. Most surveys have a museum for the exhibition of their collections, and usually also a library of geological literature.

In Great Britain there are departments for England and

Wales, Scotland, and Ireland, acting under one director in the head office in London. The maps (coloured geologically) are on the scale of 1 in. to 1 m. (1 in 63,360); but of the coal fields special maps on the scale of 6 in. to 1 m. (1 in 10,560) are issued, and there is an index map (4 m. to 1 in.; 1 in 253,440). In the United States similar maps are published in folios, which contain topographical, orographical, geological, and economic charts, and the scales generally correspond with those above given. German-speaking countries have, on the whole, favoured a standard scale of 1 in 25,000. In France the scale is mostly 1 in 80,000. It is usual also to print a memoir or sheet description with each division of the map, and all surveys issue memoirs, monographs, bulletins, journals, annuals, or other publications, which may be merely descriptive, economic, statistical, or purely scientific. The Geological Survey of Great Britain has its headquarters in the Museum of Practical Geology, Jermyn Street, London; that of the United States in Washington, D. C.; and that of Canada in Sussex Street, Ottawa. For the history of the Geological Survey of Great Britain, see A. Geikie's *Life of Murchison* (1875), and his *Life of Sir A. Ramsay* (1895).

Geology. The science of geology is concerned with the investigation of the structure and history of the earth's crust. Its business is to interpret the record of the past as that is revealed to us in the rocks which are exposed to our observation on the earth's surface. Their chemical composition and the minerals of which they consist, the association of these minerals to form different kinds of rock, the disposition of the strata and the manner in which they have originated and have been altered or disturbed, are the principal subjects embraced in that part of the science which is known as *physical* or *dynamical geology*. The stages of the earth's history, the chronological succession of the strata and the grouping of the individual members into formations or systems, which belong to definite epochs of geological time, together with the study of the fossils they contain, and the changes exhibited by the sequence of floras and faunas which have peopled the globe, are usually regarded as a distinct branch of the science, known as *stratigraphical* or *historical geology*.

Interior of the Earth.—Though by means of wells, borings, and tunnels it is possible to ascertain directly the condition and nature of the underlying rocks, yet this has been done only in a few areas;

and as the greatest depths to which the engineer has penetrated are not much more than one mile, only one four-thousandth part of the earth's diameter has been probed in this way. The great interior nucleus will ever remain inaccessible, and only indirect inferences can be drawn as to its composition, density, temperature, and rigidity. Yet we know that the earth is about five and a half times as heavy as an equal bulk of water, that it is as rigid as a ball of steel, and that the pressures to which its deeper parts are subjected must be enormously great. The water of the great oceans and the gaseous atmosphere form successively lighter outer envelopes. As we descend in the earth's crust the temperature of the rocks rises—very slowly, perhaps 1° F. in 50 or 100 ft., yet still so rapidly that at a depth of twenty miles the heat must be so great that even the most refractory metals would be melted, were it not that the pressure of superincumbent masses tends to retain them in the solid state. At some distance from the surface great reservoirs of molten rock must exist, from which volcanoes draw their supplies; but it is not likely, in view of the great rigidity of the whole globe, that any considerable part of it is liquid.

Surface of the Earth.—Even of the earth's surface the geologist can be said as yet to have examined only an inconsiderable portion. The great oceans conceal their beds from view; the snow fields of the polar regions obstruct geological research as effectively as do the sands of deserts and the deep forests of tropical zones. The slow attack of the atmosphere on the rock faces exposed to it, causing them to crumble into dust, is followed by the wash of the raindrop, which detaches the loosened particles and carries them to the rivulets and streams, which in their turn flow, muddy and laden with sediment, to the sea. The scouring action of running water carves the surface of the country into valley and ridge. The harder and more resistant rocks in time stand out as prominences; the softer are more rapidly lowered, and form smooth plains. The hills are often the relics of greater rock masses, which have been more or less completely removed by the slow action of the rivers. The changes are most rapid in elevated mountain regions, where the rocks are exposed to the attack of frosts and gales and torrents; they are least rapid in the plains, where debris is often accumulating locally. Sooner or later, however, upheaval follows, and erosion is greatly accelerated. On the face of the earth all is

ceaseless change: upheaval, erosion, and accumulation constantly go hand in hand.

The materials stripped from the surface of the land are transported to the sea, and are there deposited as sheets of mud and sand, to form 'the dust of continents to be.' In shallow seas the coarser fragments cover the bottom; where the water is deep and still the fine mud gathers; and far out from the shores, where little land-derived sediment is ever mingled with the clear sea water, the organic limestones and the peculiar deep-sea deposits are being laid down. The dissolved salts in river water furnish marine animals with the calcareous substances of which their shells are built up; and these, after the death of the animal, accumulate in shell-banks, which slowly consolidate into limestone rock. Subsequent upheaval may convert the sea bottom into dry land.

In the formation of rocks volcanoes also play a not unimportant part. Scattered over the globe, principally along lines which follow the shores of the continents, they discharge considerable quantities of lava and of ashes, and pile up masses of volcanic *jecta*, often of great magnitude. As the molten rock rises to the surface, it forces a way through the strata and fills up fissures and rents. Vast sheets of granite have in this way been interleaved with the stratified succession, and have cooled and consolidated far below the surface, indurating and otherwise altering the rocks in contact with them by their heat and the vapours which they emit.

Fossils.—The fossils contained in the rocks serve a twofold purpose. They indicate under what conditions the strata accumulated, whether land or fresh water, marine or estuarine. One bed may yield land-shells and roots of trees; another is composed of corals and crinoids—inhabitants of clear sea water. They also furnish a record of the sequence of living types. The age of invertebrates was followed by that of the fishes; thereafter the amphibians, the reptiles, and last of all the mammals, in turn dominated the stage. Only a fraction of the whole number of species which have peopled the globe can possibly have been preserved in the fossiliferous rocks, and of these only very few can have been discovered and made known to the paleontologist.

Development of the Science.—Before the beginning of the 19th century the sedimentary rocks were regarded as deposits of previous ages, each of which was

brought to a close by a cataclysm. The successive faunas and floras of the globe were the result of special creations. The valleys and mountains were produced by great and sudden upheavals of the strata. Palissy, Guettard, and a few others had indeed propounded theories which are now part of the fundamental principles of geology. But no one had taken a broad and sound view of the whole field of investigation before James Hutton wrote his great work on the *Theory of the Earth* (1785). A great controversy arose between his disciples and those of the older school, headed by the Saxon mineralogist Werner, who regarded the older igneous rocks as chemical precipitates from aqueous solution. The spread of Hutton's conceptions was greatly assisted by the luminous exposition they received from his disciple and friend Playfair, and the experimental researches of James Hall. At a later date Charles Lyell did much to bring the new views into general favour. Uniformitarianism was now triumphant: the present was recognized as the key to the past; the necessity for adopting explanations which were in accordance with the processes we see going on around us was universally admitted. The vast duration of geological time, and the sufficiency of the slow-acting agencies of denudation, upheaval, and volcanic action to produce the structures observed in the stratified rocks and the existing relief of the surface of the continents, were now appreciated. When Charles Darwin—who had been much influenced by Lyell—showed that no external interference with the regular course of nature was required to explain the origin of species and the successive changes in the living inhabitants of the globe, the foundations of modern geology were at last securely laid.

In the first quarter of the 19th century the advance of geology was rapid and triumphant. Great numbers of species of fossil animals and plants were described. Many active workers were mapping and examining the rocks of various parts of Europe. Among these Leopold von Buch is perhaps the most distinguished. De Saussure had published his observations on the Alps, and Alexander von Humboldt had issued the results of his travels. But the greatest service done to the science was the foundation (1790) of stratigraphical geology by William Smith, an English land surveyor, who was the first to grasp the great importance of fossils as indicating the age of the beds in which they occurred.

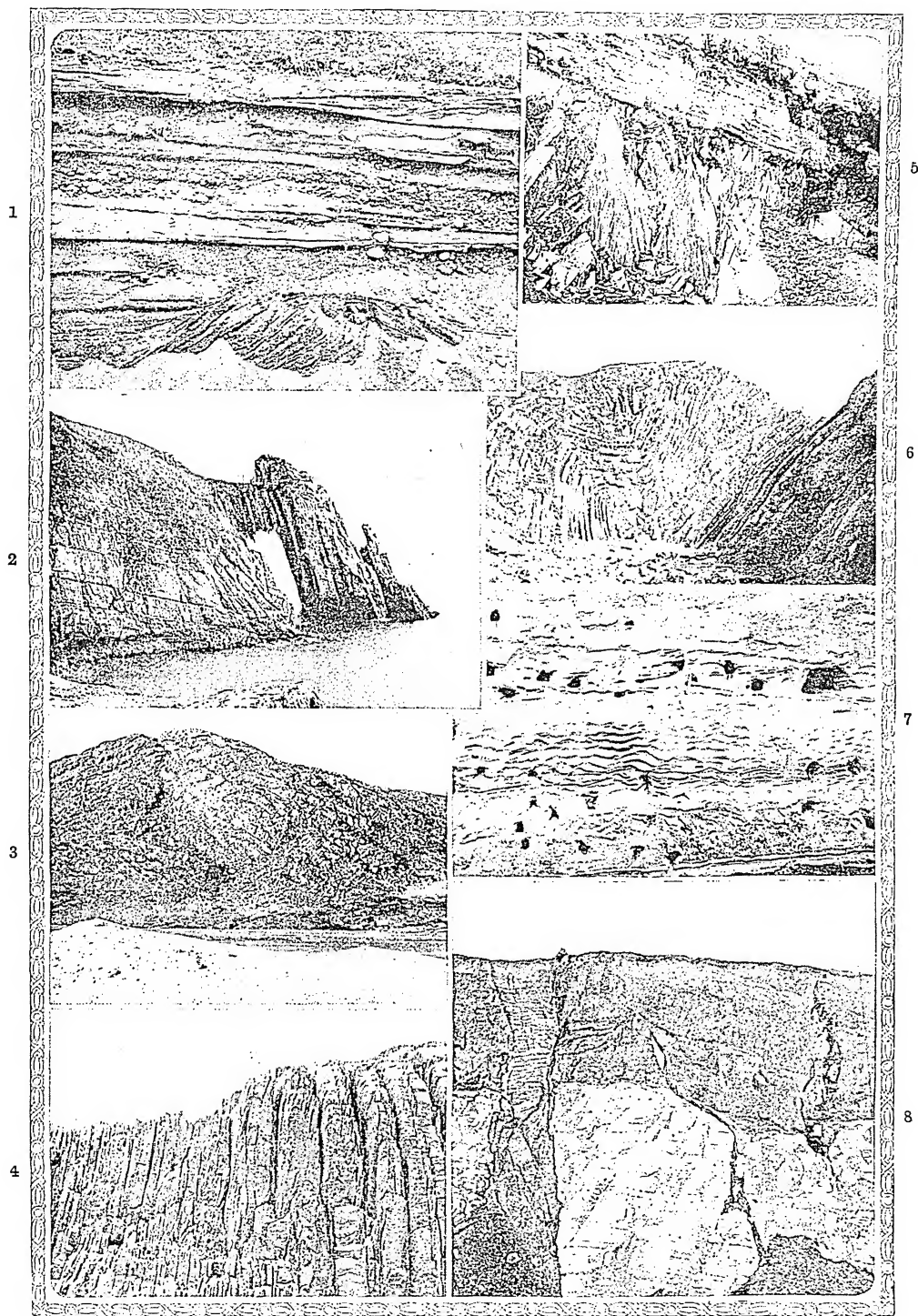
He recognized also the constant succession of new forms of life, and the possibility of identifying contemporaneous deposits in widely distant areas by means of their organic remains. Subsequently he drew up a geological map showing all the formations from the Carboniferous onwards, and his work has stood the test of time with little modification. About the same time Macculloch drafted a geological map of Scotland.

Stratigraphical Geology.—The richly fossiliferous Secondary strata of the south of England and certain parts of Germany and France were naturally the first to attract minute and patient study. At a later period Lyell proposed that the Tertiary rocks should be subdivided into Eocene, Miocene, and Pliocene by means of the percentage of living types in their molluscan faunas. To these groups the Oligocene and Pleistocene have since been added. The importance of the Carboniferous system was early recognized, but it still remained to push the work of exploration into the province of the older Paleozoic formations. The Old Red Sandstone which lies below the Carboniferous was identified; its peculiar fossil fishes were described by Agassiz and Hugh Miller; Lonsdale and Murchison showed that it was contemporaneous with the marine Devonian. In Wales, Sedgwick and Murchison proved the existence of Silurian and Cambrian rocks. The last of these is even at the present day the lowest and oldest group of fossiliferous strata, as the Precambrian rocks have not yet yielded a distinctive fauna. At a later period the 'New Red Rocks' were broken up into two series, the Permian and the Trias, which resemble one another closely in many respects, but are undoubtedly separated by a prolonged period of time.

The main subdivisions of the geological record as accepted at the present day are as follows:—

	Pleistocene or Recent.
Tertiary or Cainozoic.	Pliocene.
	Miocene.
Secondary or Mesozoic.	Eocene and Oligocene.
	Cretaceous.
	Jurassic.
	Triassic.
	Permian.
Primary or Paleozoic.	Carboniferous.
	Devonian.
	Silurian.
	Cambrian.
	Precambrian, Archaean, etc.

It has been estimated that the whole thickness of the stratified sedimentary rocks in their normal development amounts to about 30,000 ft., and that the time required for its accumulation is about ninety millions of years.



Illustrations of Geological Formations.

1. Drift sands and gravels, in part current-bedded: Moylena, Antrim. 2. Inverted strata: 'London Bridge,' Torquay. 3. Intrusive granite (light tint on right) on schist (dark tint on left): Melmore Mountain, Co. Donegal. 4. Vertical Ordovician strata: Ardglass, Co. Down. 5. Unconformity: Carboniferous limestone on Silurian slates and grits. 6. Contorted strata: Stair Cove, Lulworth. 7. Holian erosion, showing ripple marks in esker sands: Greenhill, Dublin. 8. Basalt dyke traversing chalk and basalt lavas: Cave Hill, Belfast. (Photos 1, 3, 4, 7, and 8, by Welch; 2, by Frith; 5, by Professor Reynolds; 6, by Bingley.)

A gradual passage from the fauna of the lower to that of the upper groups can generally be made out if the fossils are abundant and well preserved. On the other hand, there may have been a change in the physical conditions. In that case there is a gap in the record: the upper series rests unconformably and often discordantly on the lower, and the fossils it contains show a marked divergence from those in the strata on which it rests. Where fossils are very abundant it is possible to follow the gradual development of new types, whether the process be one of advance or of degeneration, and to mark the transitions which exist between distinct species and even genera. Geology, or rather palaeontology, has been in this way a great support of the doctrine of evolution.

Folding, Contortion, etc., of Rocks.—The problems furnished by the highly folded, contorted, and intensely crystalline rocks which compose the principal mountain chains have given rise to many ingenious speculations. It has been found that, though mountains are of more than one kind, the greater ranges have mostly originated in one way. A belt of rocks which may be many thousands of feet thick has been subjected to pressures which have thrown them into long parallel folds, and in places have produced great reversed faults or thrust-planes, along which the upper masses have been forced, overriding the lower strata. It is supposed that the cause of these phenomena is to be found in the gradual contraction of the globe on cooling, and the consequent shrinkage of the crust. The sedimentary and igneous rocks involved in these movements have been torn up, and the heat and pressure, assisted by the moisture they contained, have given them a crystalline development, which is known as metamorphism. Every stage can be traced in the passage of a coarse sandstone or a granite into a crystalline gneiss. The finer shales become mica schists. The limestones are changed into marbles. The highly complicated types of structure which result from folding have been mapped out in great detail in such regions as the Appalachians, the Alps, and the Scottish Highlands. Some epochs of folding are prior to the deposition of the oldest fossiliferous strata, while the final development of the Alps and the Himalayas was attained only in Tertiary time, and may, in fact, be said to be still in progress.

Petrology.—By using the microscope the geologist has been enabled to make deeper researches

into the structure and composition of all classes of rocks. Even the minutest mineral grains can be determined, and the whole manner in which the rock is built up can be ascertained. A vast number of new names, new ideas, and new classifications have resulted, and petrology is now one of the most progressive of all the departments of geology. At the same time, more refined and accurate methods of chemical analysis have enlarged our knowledge of the composition of the earth's crust and its components. The artificial production of rocks and of rock structures, a branch of investigation instituted by Sir James Hall, has not up to the present been so fruitful of results as the purely observational studies. But many kinds of lava have been produced by the fusion in furnaces of mixtures of the proper composition, and by suitable modification of the conditions of cooling have been led to crystallize in such a way as to imitate very closely the natural rocks. Some of the plicated structures of mountain chains have been reproduced in the contortions induced in layers of sand, mud, clay, wax, paper, and other substances compressed experimentally in the laboratory.

Bibliography.—See generally Bonney's *Story of Our Planet* (1893); Sir J. W. Dawson's *Story of the Earth* (9th ed. 1886); Sir C. Lyell's *Principles of Geology* (12th ed. 1875); Sir A. Geikie's *Primer of Geology* (1872); Professor Seeley's *Story of the Earth in Past Ages* (1895); Sir A. Geikie's *Geological Sketches at Home and Abroad* (1882); Roberts's *Modern Geology* (1893); Professor Shaler's *Sea and Land* (1895); Sollas's *The Age of the Earth* (1905).

More advanced text-books are Sir A. Geikie's *Text-book of Geology* (the best and most recent English book; 4th ed. 1903); Professor Green's *Physical Geology* (1893); Sir Joseph Prestwich's *Geology* (1886-8); Seeley and Etheridge's *Geology, Physical and Stratigraphical* (1885); A. J. Jukes-Brown's *Physical Geology* (2nd ed. 1892), and the same author's *Stratigraphical Geology* (1903); Kayser and Lake's *Comparative Geology* (1893); Professor J. E. Marr's *Stratigraphical Geology* (1898); Professor Judd's revision of Lyell's *Student's Geology* (1896); Chamberlin and Salisbury's *Geology* (1904).

History of Geology.—See Lyell's *Principles of Geology* (12th ed. 1875); Sir A. Geikie's *Founders of Geology* (1897); Mrs. Ogilvie Gordon's translation of Zittel's *Geschichte der Geologie* (1901).

Astronomical Aspect of Geology.—Chamberlin and Salisbury's *Cosmical Aspects of Geology* (1904);

James Croll's *Climate and Time* (1885); Professor Green's *Birth and Growth of Worlds* (1890); Lord Kelvin's *Popular Lectures—Geology* (1891-4); Sir R. Ball's *Cause of an Ice Age* (2nd ed. 1892); Sir Joseph Prestwich's *Controverted Questions in Geology* (1895); Professor Poynting's *Density of the Earth* (1894).

Treatises on Special Subjects.—On palaeontology, Nicholson and Lydekker's *Palaeontology* (1889); Eastman's translation of Zittel's *Text-book of Palaeontology* (1900); and Smith Woodward's *Vertebrate Palaeontology* (1898). Among popular works are: Taylor's *Common British Fossils* (1885); Hutchinson's *Extinct Monsters* (1892), also his *Creatures of Other Days* (1894); and Mantell's *Medals of Creation* (1844). Special mention should be made of the Palaeontographical Society's monographs; also Etheridge's *British Fossils* (1888), Bailly's *Characteristic British Fossils* (1867), and the catalogues published by the British Museum.

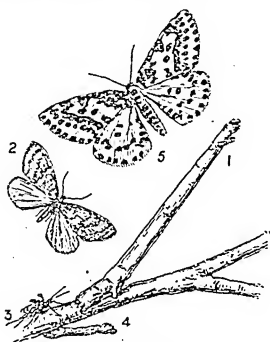
On paleobotany the standard English text-books are Professor Seward's *Fossil Plants* (1898), and Dr. Scott's *Studies in Fossil Botany* (1900). See also GLACIATION, PETROLOGY, and VOLCANOES.

Geology and Scenery.—The principal works are Professor J. E. Marr's *Scientific Study of Scenery* (1900); Professor James Geikie's *Earth Sculpture* (1898); Lord Avebury's *Scenery of Switzerland* (1896), and the same author's *Scenery of England* (1902); Sir A. Geikie's *Scenery of Scotland* (1865).

Other works which may be mentioned are Hugh Miller's *Old Red Sandstone* (1841); Milne's *Earthquakes* (1886; 3rd ed. 1893), also his *Seismology* (1898); Clement Reid's *Origin of the British Flora* (1899); Millard Reade's *Mountain Ranges* (1886), and his *Evolution of Earth Structure* (1903); the biographies of Sedgwick, Murchison, Ramsay, Penck, Owen, Croll, Ed. Forbes; Huxley's *Physiography* (1877), and his *Collected Papers* (1900); Hutton's *Theory of the Earth* (1795); Playfair's *Illustrations of the Huttonian Theory* (1802); Darwin's *Coral Reefs* (2nd ed. 1874), and his *Volcanic Islands* (1890); Elsdon's *Applied Geology* (1898); D. Page's *Economic Geology* (1874).

Geometers (*Geometridæ*), a family of moths of which the adults are in some cases known as carpet moths, while the caterpillars are known as loopers or geometers. The Geometridæ are remarkable in that the caterpillars are elongated and slender, and have only one pair of abdominal prolegs, placed in the posterior region, in addition to the anal claspers. In consequence

they progress by a 'looping' movement, the abdominal legs being brought close up to the true legs in the anterior region, so that the body is thrown into a loop. The caterpillars may closely resemble twigs, and often adopt in repose a rigid attitude, which greatly increases this resemblance. Examples are the winter moth (*Cheimatobia brumata*), whose caterpillars are often very destructive to forest trees, and the currant moth or magpie moth (*Abraxas grossulariata*), a great pest in gardens. See Poulton's *Colours of Animals* (1890), and Sharp's *Insects* (1895) in the Cambridge Natural History.



Geometers.

1. Sticklike larva of swallow-tailed moth.
2. Winter moth, male. 3. Female. 4. Larva.
5. *Abraxas grossulariata*.

Geometrical Mean of two numbers is the square root of their product. Thus, if g is the geometrical mean of the numbers m and n , $g^2 = mn$. Otherwise $m : g = g : n$; so that if $g = rn$, we have $m = rg = r^2n$. And hence we see that the second of any three consecutive terms of a geometrical progression is the geometrical mean of the first and third terms. Since

$$\frac{1}{2}(\sqrt{m} - \sqrt{n})^2 \text{ or } \left(\frac{m+n}{2} - \sqrt{mn}\right)$$

is necessarily a positive quantity, it follows that the geometrical mean \sqrt{mn} is never greater than the arithmetic mean, and is equal to it only when $m = n$. If from any point on the circumference of a circle we draw a perpendicular to any diameter, this perpendicular will be the geometric mean of the segments of the diameter. Hence, to construct geometrically the geometric mean of two given lines, we have simply to set them end to end in one straight line, describe a circle on this line as diameter, and then from the meeting-point of the ends raise a perpendicular till it meets the circle. This perpendicular is the geometrical mean.

Geometrical Progression is the name of a series of terms each one of which is derived from

the preceding term by multiplication by a definite factor; $1 + 2 + 4 + 8 + \text{etc.}$, and $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \text{etc.}$, are simple examples. In the former case the sum increases indefinitely with the number of terms; in the latter case it can never exceed two, however many terms be taken. These are respectively divergent and convergent series. The repeating or recurring decimal is really a geometrical progression with an infinite number of terms. Thus,

$$\frac{1}{3} = \frac{3}{10} + \frac{3}{100} + \frac{3}{1000} + \frac{3}{10000} + \text{etc.}, \text{ to infinity, the factor or ratio being one-tenth. Similarly, } \frac{1}{11} = \frac{9}{100} + \frac{9}{10000} + \frac{9}{1000000} + \text{etc.}, \text{ to infinity. See SERIES.}$$

Geometry is the deductive science which treats of the properties of various kinds of space—linear, planar, two-dimensional, three-dimensional, and soon. The branch of geometry which first took definite shape was plane geometry. With the development of astronomy spherical geometry became necessary, and with it solid geometry, or geometry of three dimensions. The geometry of what we believe to be the three-dimensional space occupied by the visible universe includes those just indicated, and is usually distinguished as Euclidian geometry, or the geometry of Euclidian space, since it is the geometry which is deduced from the fundamental axioms, postulates, and definitions laid down by Euclid in his *Elements*. Within the last half-century, however, non-Euclidian geometries, or geometries of space whose properties do not satisfy all the axioms and postulates assumed by Euclid, have been developed.

PLANE GEOMETRY.—Euclid's classic *Elements* have long been the recognized standard in Britain, but now they are being superseded by other methods; and very soon the first six books of the *Elements*, dealing with plane geometry, will be as obsolete as the four books which treat of arithmetic.

The idea which dominated the minds of the ancient geometers was to deduce, in logical sequence, from the smallest possible number of axioms a series of geometrical truths of growing complexity. The particular sequence of propositions which constitutes Euclid's *Elements* was at one time supposed to be the best possible. It is, however, demonstrably illogical, in the sense that a truth is implicitly assumed in one proposition before it is proved in a later one. Then it has long been recognized that certain of the propositions established are of comparatively little importance,

while certain important geometrical truths find no place within its pages. There is also a lack of scientific system, so that propositions which are closely allied are widely separated, for no apparent reason. In Euclid's system the propositions are of two kinds: (1) theorems in which a truth is proved; (2) problems in which a geometrical construction is made, and no geometrical construction is assumed as possible until it has been logically done. For example, we cannot make use of any argument based on the possibility of bisecting an angle, until the method for bisecting the angle has been rigorously demonstrated. This unnecessary restriction leads to a confused mingling of problems and theorems, especially in Book I. By removing it we are able greatly to simplify certain proofs, and to bring together in closer relationship allied propositions.

In the modern treatment of plane geometry, geometrical drawing and the testing by measurement and calculation of the theorems proved are introduced as valuable aids, and the sequence of propositions is arranged according to the following broad divisions:—(1) Angles and their measurement, leading up to the simpler properties of triangles; (2) parallels and parallelograms; (3) the various properties of the circle; (4) the notion of ratio and proportion, and the treatment of similar figures; (5) areas; (6) loci and analysis of problems. This practically goes over the ground of the six books of Euclid's *Elements*. Ratio and proportion form the subject-matter of Book V.

A very important conception in geometry is the notion of a locus. It should be introduced as early as possible, being simply the systematic extension of the self-evident truth that a line is an assemblage of points, and a surface an assemblage of lines. Let the points be subject to a definite condition, and the line is determined as a locus. For example, if the distances of each point from two given straight lines have a constant ratio to one another, the (plane) locus of the points will be a straight line, passing through the meeting-point of the two given lines.

The geometrical conception of *direction* is one which has not received the attention it merits. It really underlies the notion of an angle between two lines, for the angle measures their difference of direction. Lines with the same or opposite direction are parallel in Euclidian space. When we think of a line as having direction as well as magnitude (or length) we call it a 'vector.' The geometry of vectors is in its

initial stages remarkably simple, and leads almost intuitively to the demonstration of important geometric truths. We owe to Sir W. Rowan Hamilton one of the most completely worked out systems of vectorial geometry, as embodied in his great calculus of quaternions.

SOLID GEOMETRY.—The distinction between plane and solid geometry is not fundamental. The former is naturally studied first, because of the possibility of drawing completely representative figures. The effective study of solid geometry, at least in Euclidian form, is very difficult without the use of models. With the exception of the geometry of the sphere, the right cone, and cylinder, with their sections, and of the regular solids, the cube, tetrahedron, polyhedron, etc., little real progress was made by the ancient geometers. It is almost necessary, indeed, to have recourse to the analytical methods of co-ordinate geometry before any substantial advance is possible in geometry of three dimensions.

PROJECTIVE GEOMETRY.—There is, however, an important modern development of synthetic geometry, known as projective geometry, in which the elements or constituents are the point, the straight line, and the plane. There are six fundamental configurations. (1.) A straight line, as composed of all the points on it, is called a 'range of points.' (2.) All the lines in a plane through a fixed point form the 'rays of a pencil of lines.' (3.) A system of coaxial planes in space forms a 'pencil of planes.' Each of these configurations contains a onefold infinity of elements. (4.) All the points (or lines) in a plane form a 'field or plane of points' (or lines). (5.) All the planes (or lines) through a point in space form a 'sheaf of planes' (or lines). (6.) Last of all, there is 'ordinary space' as composed of all the points, lines, ranges, planes, etc., contained in it.

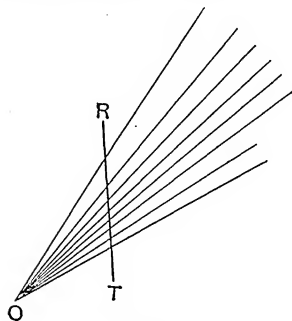


FIG. 1.

Section and Projection.—A straight line TR (Fig. 1) cutting a

pencil of lines (or planes) is called a 'transversal to the pencil,' and has thereby determined on it a range of points. A transversal plane cuts a pencil of lines in a range, or a pencil of planes in a pencil of lines, and a sheaf of planes (or lines) in a field of lines (or points). In each case a section of the original configuration is obtained. By drawing lines through a point O to all the points of a range, the range is projected into a pencil, and similarly a field is projected into a sheaf. The coaxial planes through a line and the points of a range project the latter into a pencil of planes. The two operations of section and projection are the fundamental operations in projective geometry.

Definition.—Those geometrical properties of figures and configurations which remain unaltered by the operations of section and projection constitute their projective properties, and the science of these is the projective geometry of the figures and configurations.

Duality.—A general principle running through the whole of the science is the principle of duality, in virtue of which to every theorem there corresponds another theorem whose statement may be made when the first is given. In plane projective geometry the dual elements are the point and the line. *Example 1.*—Two points determine a line. *Duality.*—Two lines determine a point. *Example 2.*—The points of a range. *Duality.*—The rays of a pencil.

To every theorem concerning points and lines there corresponds a theorem concerning lines and points. In the sheaf, dual elements are the line and the plane. In space, the dual elements are point and plane: line (join of two points) and line (intersection of two planes); plane (as given by three points) and point (as intersection of three planes).

Infinite Elements.—In order to avoid exceptions to general propositions, it is convenient to assume that a range of points has only one point at infinity, and that two lines are parallel when their points at infinity coincide. Hence all parallel lines pass through a common point at infinity, parallel lines in a plane form a pencil, and parallel lines in space a sheaf. The curve of points at infinity in a plane is a straight line (curve of first degree), and the points at infinity in space lie on a plane (surface of first degree).

PROJECTIVE GEOMETRY IN A PLANE: Perspective.—A range is said to be in perspective with a pencil when the constituents of the range and pencil are so associated that every point of the range lies on the corresponding

ray of the pencil. Thus, any transversal to a pencil of lines determines a range in perspective with the pencil. Two ranges are in perspective when they are sections of the same pencil (whose centre is the *centre of perspective*); and two ranges are in perspective when they have a common transversal range. In this association, to every element of the one configuration there corresponds a unique element of the other. It is obvious that the point of intersection of two ranges in perspective is self-corresponding, as is the common ray of two pencils in perspective.

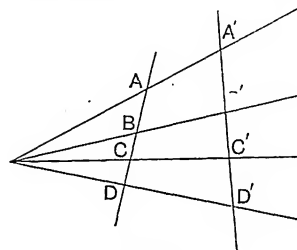


FIG. 2.

Anharmonic or Cross Ratio:

Definition.—If A and B are two fixed points (base points) of a range, and C any third point, the ratio AC/BC is called the 'position ratio' of C with respect to A and B; and if D be a fourth point, the quotient of the ratio $AC/BC \div AD/BD$ is called the 'cross ratio' of the range of the four points A, B, C, D with respect to A and B as base points. (Fig. 2.) This cross ratio is denoted by $(ABCD)$. It may be proved that if two transversals ABCD and A'B'C'D' are drawn to a pencil of four lines (or planes), then $(ABCD) = (A'B'C'D')$. This is a theorem of the first importance in projective geometry. The common value of the cross ratio is called the 'cross ratio' of the pencil. In particular, when the value of the cross ratio is -1, the range is called a 'harmonic range' of four points, or the pencil of four lines a 'harmonic pencil.' Any theorem in projective geometry which is not purely statistical can in general be deduced from the consideration of the invariance of such cross ratios by the operations of section and projection.

Projective Ranges, etc.—It is clear that if two ranges or pencils are in perspective, the cross ratio of any four elements of the one is equal to the cross ratio of the corresponding four elements of the other. When two ranges or pencils, or a range and a pencil, are so associated that the cross ratio of any four elements of the one equals the cross ratio of the corresponding four elements of

the other, the two configurations are said to be projective. Two configurations which are in perspective are necessarily projective. Also, when two projective ranges or pencils have their common element self-corresponding, the two configurations are in perspective. If the common element is not self-corresponding, the two configurations can certainly not be in perspective (see above).

Projective Generation of the Conic Section.—If two projective ranges are not in perspective, the straight lines joining corresponding points of the ranges, AA' , BB' , CC' , etc., are all tangents to the same conic (curve of the second class), which is called their envelope, and which is touched by the lines of the ranges themselves. There is also the dual theorem: If two projective pencils are not in perspective, the intersections of corresponding rays generate a conic (curve of the second degree), which passes through the centres of the two pencils. From these two theorems may be deduced all the projective properties of conic sections. Thus, if four tangents to a conic are taken, any other tangent is cut by them in four points whose cross ratio is constant; and if A, B, C, D are four fixed points on a conic (Fig. 3), and O any fifth point on it, the cross ratio of the pencil of lines $O(A, B, C, D)$ is invariant so long as A, B, C, D are kept fixed. The converse of each theorem is true. Immediate consequences of these theorems are:—

(1.) **Pascal's theorem:** If any six points are taken on a conic (curve of the second order) and joined in any order to form an inscribed hexagon, the three intersections of pairs of opposite sides of the hexagon lie on a straight line. (2.) **Brianchon's theorem,** which is the dual—viz.: If any six tangents to a conic (curve of the second class) are taken in any order to form the sides of a circumscribing hexagon, the three diagonals joining pairs of opposite vertices are concurrent in a common point. See *Reye's or Cremona's Projective Geometry*.

Collinear Projective Ranges and Concentric Projective Pencils.—Let the lines of two projective ranges $ABCD \dots$, $A'B'C'D' \dots$ be made to coincide; then every point on the line has a twofold interpretation, according as it is considered as belonging to the first range or to the second. Thus to A on the first corresponds A' on the second range, but to A' as on the first range does not in general correspond A on the second. When this does happen for all points A and A' , the two ranges are said to determine an *involution* on the lines. There

are two points in the involution, each of which coincides with its correspondent. According as these points are real, coincident, or imaginary, the involution is hyperbolic, parabolic, or elliptic. These points are called the 'double points' of the involution. The point corresponding to a given point is called the 'conjugate' of the latter. The range of four points, formed by the two double points of a hyperbolic involution and any two conjugate elements, is a harmonic range. The case of a pencil of lines in involution is entirely analogous. An example of this kind of correspondence is given by the theorem, that the conics through four fixed points cut any transversal line in pairs of points which are in involution (Desargues), and its dual or reciprocal—viz.: The pairs of tangents drawn from a fixed point to the conics that touch four given lines determine conjugate pairs of lines of a pencil in involution whose vertex is the fixed point.

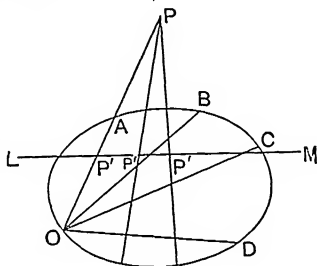


FIG. 3.

Pole and Polar.—An excellent example of the methods of projective geometry is furnished by the theory of pole and polar for a conic. The locus LM (Fig. 3) of the harmonic conjugates P' of a point P with respect to the pairs of points in which the rays through it are cut by a fixed conic is called the polar of P , which is the pole of its polar. The polar is a straight line through the points of contact of the tangents from P , when these are real. To a pole corresponds a unique polar. To all the points of a range correspond all the rays of a pencil; and the projective properties of range and pencil are identical. The theory of pole and polar furnishes a simple illustration of the principle of duality.

CO-ORDINATE or ANALYTICAL GEOMETRY is a method of singular power and symmetry. The principle of the method is explained under **CO-ORDINATES**, and one of its important applications is described under **CURVE-TRACING and GRAPHICAL METHODS**. One important branch of it is called **Cartesian geometry** (after Descartes,

the discoverer of the method). It is essentially a method of projection, the properties of curves and surfaces being studied by means of their projections on definite lines or planes, or their sections by definite lines or planes. The vector from the origin to any point on the curve or surface is decomposed into its projections along chosen directions, usually rectangular. These projections, symbolized by the letters x, y, z , are the co-ordinates of the point; and when a single algebraic relation connects them, we have the equation of the surface containing the assemblage of points whose co-ordinates satisfy the equation.

As a simple example, consider the equation $xyz=1$. Here x cannot be zero for finite values of y and z ; hence the co-ordinate axes do not meet the curve in any finite point. If we put $x=a$, a constant, we are finding the intersection of the surface $xyz=1$ by the plane parallel to the plane yz , and distant a from it. The result is $yz=a^{-1}$, the equation of a hyperbola with asymptotes parallel to the y and z axes. And generally, if cut by a plane perpendicular to any one of the axes, the surface yields a hyperbola. The quantities xyz cannot all be negative simultaneously, nor can one be negative alone. Hence the surface occupies only four of the octants into which the co-ordinate axes divide space, and consists of four similar cup-like sheets, to which the co-ordinate planes are asymptotic.

The Cartesian method leads to a systematic classification of curves and surface according to the order of the equation which represents it. Thus, the surface indicated above is a cubic surface. The method has also a close relation to the algebraic theory of functions of two or three variables, the analytical theory being greatly aided by illustrations from the geometric property of curves or surfaces, of which the functional expression may be taken as the equation.

Although the most useful system of analytical geometry is the Cartesian, with its fixed axes of reference, there are other systems having special advantages for certain types of problems. Such are the polar co-ordinates, which are of particular service in astronomy. It is found to be more convenient to fix a planet's position by means of its distance from the sun, and the two angles which determine the position of the radius vector, than to use the xyz co-ordinates. Also, a system of special value in plane geometry is the method of trilinear co-ordinates.

GEOMETRY OF SPACE OF FOUR or HIGHER DIMENSIONS.—When

we deal with a function of more than three variables, we cannot represent it by means of a surface in our space of three dimensions. But we may imagine the existence of a space of higher dimensions, in which the function could be represented by a geometrical reality. For example, just as the equation $ax + by + cz = 1$ represents a plane in space of three dimensions, so the equation $ax + by + cz + dw = 1$ (where w is a fourth variable) may be imagined as representing a simple three-dimensional stretch in space of four dimensions. Some of the properties of space of four dimensions may be imagined, or at least described, by a process of analogy. The point, the line, the surface, and the volume are respectively spaces of no dimensions, one, two, and three dimensions. We see at once that two points bound one finite straight line, four lines bound one square, six squares bound one cube; hence eight cubes will bound a four-dimensional figure, which will have a symmetrical eight-sided aspect to the four independent perpendicular directions which exist in four-dimensional space. Again, just as we from our three-dimensional point of view can look inside a square or circle or other closed plane curve, the inside of which could not be seen by a two-dimensional inhabitant, so by analogy we infer that the inside of cubes, spheres, etc., could be seen by an intelligence residing in four-dimensional space. In other words, every part of the contents of a three-dimensional volume could be seen from a four-dimensional standpoint. See *Flatland*, by a 'Square' (1884), and Hinton's *Space of Four Dimensions*, for a popular account of these geometrical speculations.

NON-EUCLIDIAN GEOMETRY, or the geometry of non-Euclidian space, is based upon the recognition that certain properties of space, regarded by the early geometers as self-evident truths, are, strictly speaking, the results of experience, and are not necessarily essential. Consider, for example, the following statements, which will be found in any book on elementary geometry:—(1) A straight line is defined as the shortest distance between two points; (2) one straight line cannot intersect another in more than one point; (3) straight lines which intersect have different directions, and straight lines with the same direction never meet, and are said to be parallel. Practically every one accepts these statements as true, for in no one's experience have they ever been falsified. But the question arises whether, as a matter of strict logic, statements

(2) and (3) necessarily follow from definition (1), or whether they do not involve a further definition. Let the two-dimensional spread be what is to our three-dimensional experience a spherical surface, and let it be the universe to two-dimensional intelligences, whose direct experience is limited to a very minute part of the surface. To such intelligences a triangle which they can measure completely will have the properties of a plane triangle; the sum of its angles will not differ appreciably from two right angles. Yet it is nevertheless a spherical triangle; and if the intelligences were able to measure a large enough triangle with sufficient accuracy, they would find that the sum of the angles differed from two right angles.

Again, to the two-dimensional inhabitant of spherical space, the shortest line joining two points, which to him would be a straight line, is really a part of a great circle. Yet it is nevertheless a finite, though unbounded, line, ultimately returning to itself. Contiguous bits of 'straight lines,' which to him appear to be parallel, would, if produced indefinitely, cut in two points. Now, just as this inhabitant would imagine that his two-dimensional spherical space was really plane, so we, from our limited experience in three-dimensional space, imagine it likewise to be without 'curvature.' We believe that if we could measure the angles of the great triangle formed by our sun and the stars Sirius and Vega, the sum of these angles would be two right angles. But it is conceivable that this might not be so, but that the triangle formed by the shortest distances joining each pair of stars might have the sum of its angles different from two right angles. Three-dimensional space in which this would occur would not satisfy all the axioms and postulates laid down by Euclid. It would be non-Euclidian space. In such a space it is demonstrable that *equidistant* straight lines do not satisfy the other well-known property of parallel lines, that any transversal cuts them at the same angle. In one kind of non-Euclidian space known as 'elliptic space,' if we draw from contiguous points of one straight line two straight lines—i.e. shortest lines joining any two points in them—perpendicular to the first-named line, then two straight lines which would be parallel in Euclidian space can be proved to meet in two points, exactly as two great circles on a spherical surface meet. Thus the condition assumed in Euclidian geometry, that two different straight lines cannot meet in two points, is no longer

satisfied. Also, in elliptic space, every straight line, if produced far enough, returns to itself; and the space is finite, but unbounded. A perfectly consistent geometry of elliptic space can be constructed; and although some of the properties seem to be at first glance almost unthinkable, there is, after all, no logical reason for denying the possibility of the existence of such a space.

Text-books.—Synthetic: Rey's *Lectures on the Geometry of Position* (pt. i., Eng. trans.); Cremona's *Projective Geometry* (1885). Analytical: Salmon's *Conic Sections* (6th ed. 1879), and Miss C. A. Scott's *Modern Analytical Geometry* (1894).

Geomorphology describes and explains the forms into which the outer part of the earth's solid crust can be subdivided. For the geologist the structure, for the geographer the superficial configuration, is the most important.

Classification of Land Forms by Structure.—Igneous rocks are usually found in masses, and form mass lands. They may be flat, like the lava flows of Iceland and Hawaii and the trap-covered areas of the Snake-Columbia basin of North America and the northwest of the Deccan—volcanic table lands or trap lands; or they may form a number of cones or domes rising above the surface, as in the *puys* of Auvergne—cone or dome land. Sedimentary rocks lie either horizontally, or are fractured, bent, or folded, forming flat lands, fracture lands, bent or flexure lands, fold lands. In flat lands the rocks lie almost horizontally, and the dip is *nil*, or nearly so. In fold lands the rock layers are folded, the dip constantly alters, and the natural surface is a series of up-folds and down-folds. In fracture lands the layers are faulted, and may be either horizontal or tilted. They may form a cliff or an escarpment, or a series of such. If there are faults on both sides of an axis of relatively raised land, we have a block ridge. If faults are formed all round a central elevated mass, they make a block mount (a 'horst'). Similarly, we may have a faulted furrow or valley (a 'rift trough') and a faulted hollow.

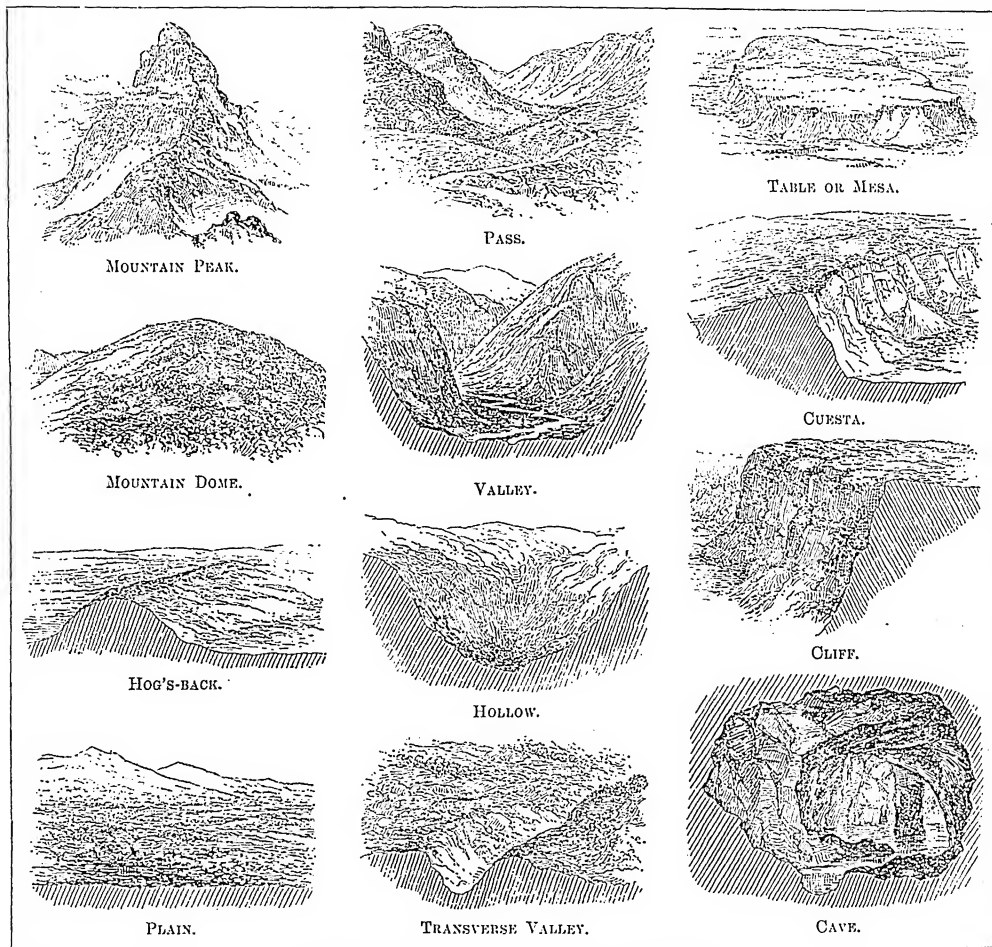
But surface forms are not only a function of the internal structure; they are also a function of the forces which have modelled them. We have to distinguish between (1) weathering, due to changes of temperature, the gradual crumbling away and accumulation of rock waste under the action of the weather; (2) mechanical erosion, by moving air or air and rock waste; (3) mechanical erosion, by moving ice or ice and rock waste; (4)

mechanical erosion, by moving water or water and rock waste; (5) chemical erosion, by water and substances dissolved in water.

Professor Penck and others have suggested a classification of land forms according to their superficial contours. Where the land surface is approximately flat it forms a plain. Where the land rises on all sides to a maximum point—the summit—it

Davis calls a *cuesta* if one slope is a dip slope. Where the land rises to a maximum surface or plain, a table is formed, called *mesa* in some parts of America. If the slope bounding it is perpendicular, it is called a cliff. When a steep slope is nearly perpendicular to the dip of the rocks, it is called an escarpment, or simply a scarp. Where the land falls on all sides to a mini-

on two opposite sides, but falls on the two opposite sides at right angles to the first two, it forms a *col* or pass. A *col* is the maximum point of two valleys, the minimum point of two ridges. Where space is completely or almost completely surrounded by the land, it is called a cavern. Similar forms existing under the ocean may be distinguished as submarine.

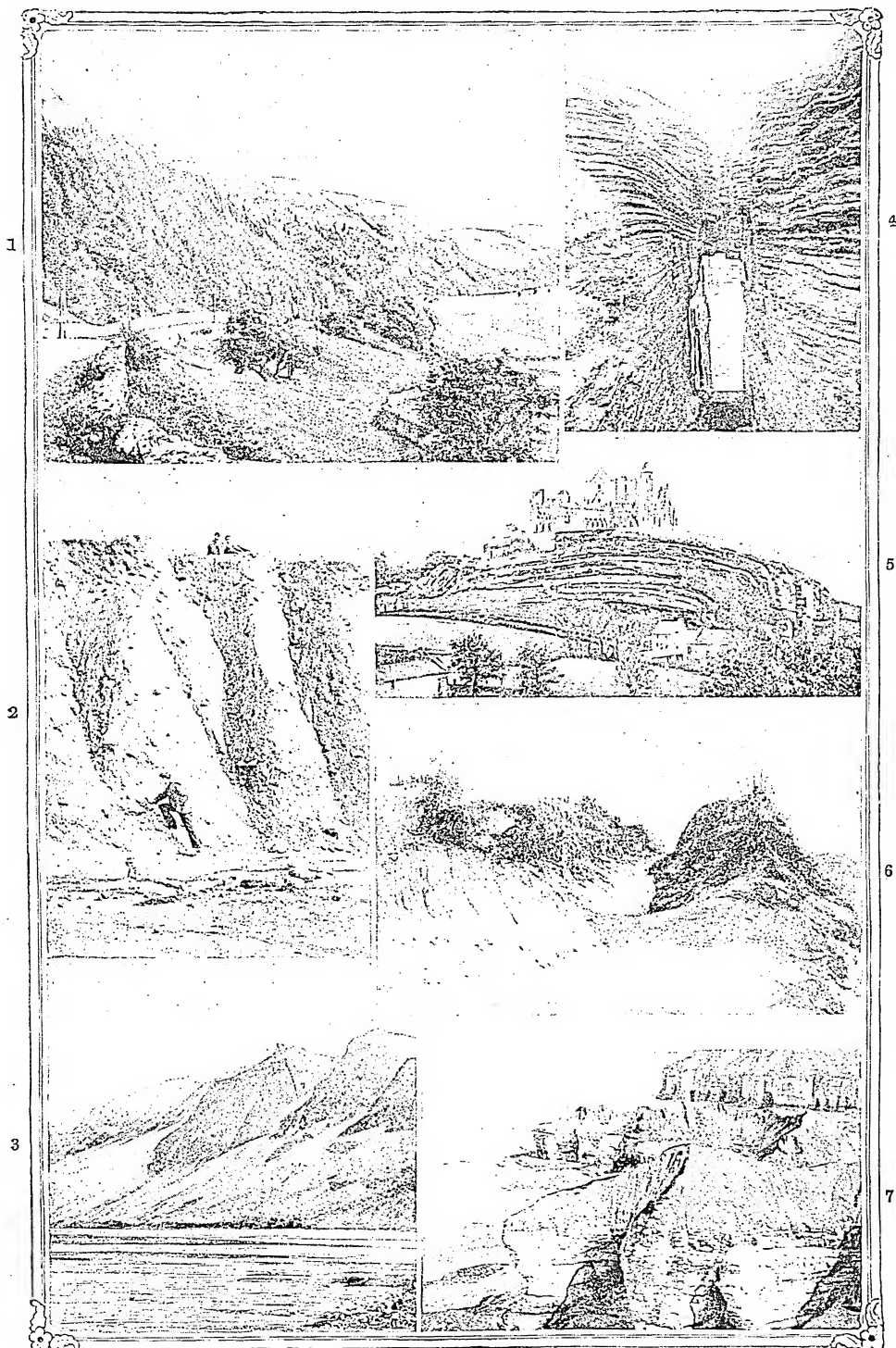


Diagrammatic Illustrations of Land Forms.

forms a mount; and we may distinguish between a peak, where the upper slopes are steep, or a dome, where they are gentle. Where the land rises to a maximum line—the crest—it forms a ridge, which, if very rounded near the crest, is known as a hog's-back; and if the two slopes are very dissimilar, one steep, the other gentle, it forms a scarp ridge, which Professor W. M.

Davis calls a *cuesta* if one slope is a dip slope. Where the land falls to a minimum line, it is called a furrow or trough. If this minimum line has itself a steady slope in one direction, the furrow forms a valley. Where the land falls to a minimum surface, it forms a depression. (The word 'basin' would be the best here, were it not used for the drainage area of a river system.) Where the land rises

Orders of Forms.—The surface of the solid crust may be (1) studied as a whole; (2) divided into portions above and below sea-level; (3) each portion may be subdivided, the divisions depending on position relatively to the sea-level. When the proportion of land at every elevation and depth is calculated, the curve obtained by plotting the results is called the 'hypsometric curve.' This can be



Geomorphology: Typical Land Forms.

1. Fracture land—fault in limestone: Giggleswick Scar. (Photo by Frith.) 2. Rain-sculptured boulder clay: Bundoran, Ireland. (Photo by Welch.) 3. Debris from crumbling mountains: The Scree, Wastwater. (Photo by Frith.) 4. Old Red Sandstone excavated by water: Devil's Bridge, Thurso. (Photo by Norrie.) 5. Dome of limestone rising from peat plain: Rock of Cashel, Tipperary. (Photo by Welch.) 6. Erosion retarded by bent roots (on right), and growing dune assisted by bent grass (on left). (Photo by Welch.) 7. Sub-aerial denudation, chalk and boulder clay: Great Thoruwick, Yorks. (Photo by Bingley.)

divided into—(1) the land crest; (2) the mass of the land; (3) the margin of the land (lowland); (4) the submerged platform; (5) the great slope; (6) the ocean floor; (7) the ocean deeps. (See OCEAN.) It is desirable that a set of terms should be consistently employed which denote decreasing area or complexity. For area alone it is suggested that this descending series should be—continent, country, region, district, locality. In the cases of the different types of land forms the following terms are suggested:—(1) For young folded mountains—mountain system, chains with plateaus, ranges with intermont plateaus and valleys, ridges, peaks. The maximum line of a ridge is a crest, the highest point of a ridge is a summit. (2) For denudation highlands—highland system, highlands, massives, ridge, peak or dome, or other descriptive term. (3) For table-lands—system, massive, table or mesa, table-mount or buttes, may be used.

The Topographic Cycle.—The series of changes of form which the surface undergoes in passing from any one form back to a homologous form is termed a topographic form-cycle. We may begin the consideration of a cycle with the upheaval of a plain into a more or less irregular raised land, and call this an early, immature, or young phase, such as that of the highest and most recent mountains, or of a surface from which the sea or ice has recently retreated. As time goes on the irregularities of the mountains begin to be smoothed or the relatively smooth surface of the marine plain to be cut up, and the drainage system becomes better defined: the form passes through a medium, mature, or middle-aged phase. Finally, when all irregularities have been removed, the surface is nearly flat, the drainage system fully developed, but the movements of the waters sluggish: the form reaches a late, ancient, or old phase.

Genetic Classification of Forms.—Every form (*f*) may be looked upon as a function of three factors—(1) its composition and structure, *s*; (2) the forces acting on it and modifying it, *p*; and (3) the time during which it has been exposed to the action of these forces, *t*. This we may express thus—

$$F = f(s, p, t).$$

*The works of Cluvierus, Carpenter, Kirchner, and Varenius in the 17th century contain the earliest attempts at systematic treatment of surface forms according to their mode of origin. Among the standard works of the subject may be cited Desmarest's

Dictionnaire de Géographie Physique (1798-1828), Hutton's *The Theory of the Earth* (1788), and Playfair's *Illustrations of the Huttonian Theory* (1802). The works of Mackintosh, Ramsay, Hull, Jukes, and the two Geikies on the scenery of the British Isles are of great importance. The travels and teachings of A. von Humboldt stimulated the work of many continental writers. Peschel's works are valuable. Von Richthofen, in his *Führer für Forschungsreisende* (1886), gave the science of geomorphology a systematic text-book; and Penck's *Morphologie der Erdoberfläche* is a critical summary of its results to 1894. Supan's *Grundzüge der physischen Erdkunde* (3rd ed. 1903) contains very lucid and logical chapters. The greatest writer in this field is undoubtedly Edward Suess, whose *Anlitz der Erde* (1883-1905) is the first work to deal adequately with the geomorphogeny of the known world. Lapparent has written a very convenient summary of general and regional geomorphology in his *Leçons de Géographie Physique* (1898). James Geikie's *Earth Sculpture* (1898) and Marr's *Scientific Study of Scenery* (1900) contain selected chapters in geomorphology. To American writers, especially to Leslie and Dana, to Powell, Gilbert, and Davis, are due many pregnant ideas, as well as admirable monographs of restricted areas.

Geophilus, a genus of millipedes, of which one British species, *G. submarinus*, lives upon the seashore, and another, *G. electricus*, is markedly phosphorescent.

George, LAKE. (1.) New South Wales, Commonwealth of Australia, lies 25 m. s.w. of Goulburn. It is 25 m. in length and 8 m. in breadth, and is 2,129 ft. above sea-level. Its water is salt. (2.) A lake (36 m. long by 1 to 4 m. wide) in the Adirondack Mts., New York State. Its shores are extremely picturesque, and are much visited by artists and tourists. It is connected with Lake Champlain.

George, ST. (d. 303), patron saint of England, Aragon, and Portugal, stated to have sprung from Cappadocia. George was driven by the anti-Christian policy of Diocletian to a confession of faith before the emperor, which led to his torture and death at Nicomedia on April 23, 303. This day is observed in his honour by the Roman Catholic Church. Gibbon identifies St. George with George of Cappadocia, the Arian archbishop of Alexandria of the 4th century, but probability is against such an identification. The festival of St. George has partaken of a national character

in England since the decree of the Council of Oxford (1222), but it was only in the reign of Edward III. that he was definitely recognized (1349) as the nation's patron saint.

George I. (1660-1727), king of Great Britain and Ireland (1714-27). His accession was in accordance with the Act of Settlement of 1701. He was the son of Ernest Augustus, Elector of Hanover, and Sophia, daughter of Frederick, Elector Palatine, who married Elizabeth, daughter of James I. George, who was born in Hanover, married, in 1682, Sophia Dorothea of Zelle, whom, in 1694, on account of an intrigue with Count Königsmark, he confined for the rest of her life. In 1698 he became elector, and in the Spanish Succession war commanded the imperial troops. George's preference for Hanover to England was not popular with his English subjects. The failure of the Jacobite rising (1715-16), the successful foreign policy of Stanhope, who made the Triple Alliance (1717) with France and Holland, and the Quadruple Alliance (1718), together with the firm policy of Walpole and Townshend (1721-7), strengthened the Hanoverian dynasty. During George's reign cabinet government was developed, and George showed himself alive to his responsibilities.

George II. (1683-1760), son of George I., was born at Hanover. In 1705 he married Charlotte Caroline of Brandenburg-Ansbach, a capable woman, who proved a most useful adviser. Through her influence Walpole, who had been dismissed on the accession of George to the English throne in 1727, was restored to power. Like his father, he was liable to regard continental affairs as of the first importance. After the death of Queen Caroline (1737) and the fall of Walpole, George found in Carteret a minister whose views agreed with his own. In the Austrian Succession war (1741-8) England played a considerable part, and in 1743 George fought in the battle of Dettingen. It was the last battle at which an English king was present. Successive Whig governments conducted to the firm establishment of the Hanoverian dynasty on the English throne; and in the Seven Years' war the ability of Pitt, and the skill of English generals and admirals, led to a revival of enthusiasm, which resulted in the foundation of the British empire. See Ward's *Great Britain and Hanover* (1899), Hervey's *Memoirs of the Reign of George II.* (1854), and Horace Walpole's *Memoirs of the Last Ten Years of the Reign of George II.* (1822-46).

George III.

George III. (1738-1820), the son of Frederick Louis (d. 1751), eldest son of George II., was born in London. He ascended the throne in 1760, and the year after married Charlotte Sophia of Mecklenburg-Strelitz. His reign was throughout adorned by writers of great literary talent, such as 'Junius,' Gibbon, Johnson, Cowper, Scott, Byron, Coleridge, Wordsworth, Southey, Shelley, and Keats. George was not content to leave the management of the country in the hands of his ministers, but was determined to govern himself, and endeavoured to carry out the principles laid down in Bolingbroke's *Patriot King*. But although he triumphed over the Whigs, the skill and firmness of William Pitt in the years succeeding 1784 prevented the victory of the king from having consequences disastrous to the country. Brave, honest, and religious, George III. represented the type of the ordinary Englishman. But he was obstinate, narrow-minded, and unable to take a statesmanlike view of things.

In 1763 the unpopularity of Bute led to his supersession by George Grenville, whose ministry is distinguished (1) by the arrest on a general warrant of John Wilkes, the editor of the *North Briton*, for criticising the king's speech in No. 45 of that paper; and (2) by the imposition of the Stamp Act on America. The latter caused a widespread agitation in America, which led to open resistance on the part of the colonists. The ministry, too, prevented Wilkes from sitting as member for Middlesex, and became very unpopular. George was thus able to place Lord North, a Tory after his own heart, in power, and from 1770 to 1782 England was governed in accordance with the king's principles and wishes. In 1775 war broke out with the American colonists, and in 1776 the Declaration of Independence was issued. In 1778 and 1779 France and Spain aided the colonists; England for a time lost the command of the sea; and in 1783 the independence of the American colonies was recognized. In 1782, Lord Rockingham, leader of the Whig party, became prime minister. His death a few months later was followed by the short-lived ministry of Shelburne, and then by the coalition of Whigs and Tories under Fox and North. Seeing the unpopularity of an India Bill introduced by Fox (1783), George III. unconstitutionally interfered, dismissed the ministry, and placed William Pitt in power. Till 1801 Pitt remained prime minister, and allowed no interference of any

moment on the part of the king. The industrial revolution was developing, and England was rapidly becoming a great manufacturing country. Important events were also taking place abroad. In 1788 Pitt formed his famous Triple Alliance, between England, Prussia, and Holland, to secure peace in Europe, and in 1789 the French revolution broke out. At first it occasioned no alarm in England; but the deposition of Louis XVI. on August 10, 1792, followed by the Septem-

lasted from 1803 to 1815, taxed all England's energies. George III. was supported by the nation, though it suffered heavily, especially during the years 1810-11. The king, owing to the illness of the Princess Amelia, became, after four previous attacks, permanently insane (1811). An increased interest in India was aroused, and steps were taken for the colonization of Australia and New Zealand. See Horace Walpole's *Memoirs of the Reign of George III.* (1894).



King George of Greece.
(Photo by W. S. Stuart.)

her massacres and by aggressions abroad, caused a change of feeling. In February 1793 France declared war on England, and Pitt was forced to adopt a number of repressive and defensive measures. In 1798 a rebellion broke out in Ireland, which necessitated the union of England and Ireland in 1800. As George refused to consent to a Catholic Emancipation Bill, Pitt resigned, leaving to his successor, Addington, the task of making the peace of Amiens with France in 1802. The contest with Napoleon, which

George IV. (1762-1830), the oldest son of George III., was born in London. He had become Prince Regent in 1811. He was far from being popular, and had posed as a Whig. In 1795, after previously marrying in secret Mrs. Maria Anne Fitzherbert, he had married Caroline of Brunswick, from whom on his accession (1820) he endeavoured to get a divorce. Public opinion showed itself strongly hostile to George, and the Commons voted the queen £50,000 a year. In 1821, however, the queen died. The

reign of George IV. saw the continuance of that progress which had set in on the conclusion of the great war. The foreign policy of Canning (who on Castlereagh's death in 1822 became Foreign Secretary) placed England in a commanding position on the Continent. Canning checked the Holy Alliance in Europe, and supported the Greeks in their struggle for independence. In 1827 Lord Liverpool resigned, and Canning became prime minister. But he died the same year; and after Goderich's short ministry the Duke of Wellington, in January 1828, formed an administration. In 1828 the Test and Corporation Acts were repealed; and in 1829, George IV., by the advice of Wellington, withdrew his opposition to Roman Catholic emancipation. Ireland was thus temporarily pacified. See Justin MacCarthy's *The Four Georges* (1884), and W. H. Wilkins's *Mrs. Fitzherbert and George IV.* (1905).

George V. (1819-78), king of Hanover, son of Ernest Augustus, Duke of Cumberland, and grandson of George III. of England, was born at Berlin, and became heir to the kingdom of Hanover on the accession of Queen Victoria, and succeeded in 1851. The result of his statesmanship was a disagreement with Prussia at the time of the Austro-Prussian war (1866), ending in the surrender of the Hanoverian army at Langensalza in June. Hanover was annexed by Prussia. George spent his later years chiefly at Gmunden in Austria. See O. Klopp's *König Georg v.* (1878); O. Theodor's *Erinnerungen an Georg v.* (1878); and Von Wehrs's *Biographie . . . König Georg v.* (1878).

George I. (1845), king of the Hellenes, is the second son of King Christian IX. of Denmark, and brother of Queen Alexandra. After the revolution in Greece (1862) and King Otho's expulsion, the crown of Greece was offered to George of Denmark, who was recognized as king on June 6, 1863. The disturbances in the Balkan Peninsula, almost continuous since their outbreak in 1876, have called for much tact and firmness in the ruler of Greece, and King George has displayed both these qualities. During the Cretan disturbances of 1896 and 1897, which led to war with Turkey, the king successfully met the complications which arose in internal politics, and increased the esteem in which he is held in Greece. In April 1905 the Cretan Assembly declared the incorporation of that island within the kingdom of Greece. In November 1905 King George made a state visit to the English court.

George, FRIEDRICH AUGUST (1832-1904), king of Saxony, youngest son of George of Saxony, was born at Dresden. He held a command in the Austro-Prussian war of 1866, and won laurels during the Franco-German war of 1870-1. He succeeded his brother Albert on the throne of Saxony in 1902, and the first event to bring his court promi-

George, PRINCE OF WALES (1865), was born at Marlborough House, London, the second son of King Edward VII.; became heir-apparent to the throne of Great Britain on the death of his elder brother, the Duke of Clarence and Avondale, on Jan. 14, 1892. Prince George Frederick Ernest Albert began his career as a cadet of the Royal Navy on



George, Prince of Wales.
(Photo by W. & D. Downey.)

nently before the world was the divorce (1903) of the Crown Princess Elizabeth.

George, PRINCE OF GREECE (1869), High Commissioner of the Powers in Crete from 1898 to 1906, is the second son of George I., king of the Hellenes, and was born at Athens. Under his rule, and under the autonomous constitution established in 1899, the island has enjoyed unprecedented tranquillity.

the training ship *Britannia* when twelve years of age. In 1877 he and his brother started upon a two years' cruise round the world in the *Bacchante*—an experience which Prince George renewed a quarter of a century later (in 1901), when, as the Duke of Cornwall and York, he made a tour to the colonies and oversea possessions of Britain on board the *Ophir*. Shortly after the close of the *Bacchante* cruise Prince George

was gazetted midshipman to the *Coda*, on the N. American station; he was promoted lieutenant in 1888, and commander in 1891. In 1891 the ancient dukedom of York was revived in his favour. He is the twelfth holder of this title since its creation in the reign of Edward III. His captaincy came to him in 1893, and with this promotion his active service in the navy came to an end, although the rank of rear-admiral was conferred upon him in 1900. He was married to his second cousin, Princess Victoria Mary, daughter of the Duke and Duchess of Teck, on July 6, 1893. The King marked the home-coming of the Duke of Cornwall and York from the *Ophir* tour by creating him Prince of Wales. In October 1905 the prince and princess left England for an extensive tour through India, and returned home in the spring of 1906. See Sir Donald Mackenzie Wallace's *The Web of Empire: a Diary of the Imperial Tour* (1902); Knight's *With the Royal Tour* (1902); Abbott's *Through India with the Prince* (1906); and Low's *A Vision of India* (1906).

George, 'THE BEARDED' (1471-1539), Duke of Saxony, succeeded to the dukedom in 1500, and was one of the most zealous supporters of the old church against the reformers. He allowed his beard to grow after his wife's death, hence the name 'Bearded.'

George of TREBIZOND (c. 1395-c. 1484), one of the revivers of Greek learning in Italy, born in Crete, his family being of Trebizond. He was for some years after 1430 itinerant teacher in Italy, then papal secretary and professor at Rome, where he translated the Greek fathers and philosophers into Latin. Having offended the Pope, he retired (1452) to the court of Alfonso of Naples, and died there. His chief work was *Comparationes Philosophorum Platonis et Aristotelis* (1523).

George, DAVID LLOYD- (1863), M.P. for Carnarvon district since 1890, is professionally a solicitor, and politically a militant radical nonconformist; born at Manchester. He fiercely opposed the Conservative government's Agricultural Land Rating Act (1896), Voluntary Schools Act (1897), and the Tithe Rent Charge Act (1899). He was in conflict with the chair during the committee stage of the Rating Bill, and was suspended on May 21, 1896, for refusing to leave the House when a division was called. He was also one of the most active critics of the Education Bill of 1902. Mr. Lloyd-George was a pronounced opponent of the S. African war, and a political visit to Birmingham during its progress led to a fatal riot. In 1904-5 he put him-

self at the head of the Welsh educational agitation. On the formation of Sir H. Campbell-Bannerman's administration in December 1905 Mr. Lloyd-George was appointed President of the Board of Trade.

George, HENRY (1839-96), American author and political economist, was born at Philadelphia. In 1858 he settled in California as a journeyman printer, and subsequently became editor of various papers. He twice unsuccessfully stood for the mayoralty of New York, where he settled in 1880. His life was devoted to the study of economical and social subjects. His principal book is *Progress and Poverty* (1879). His other works include *The Irish Land Question* (1881), *Social Problems* (1882), *Protection and Free Trade* (1886), *The Condition of Labour* (1891), *A Perplexed Philosopher* (1893), and *Principles of Political Economy* (1898). George's doctrine was that of 'the single tax,' by which the land belongs to the people, without any private ownership of land, which should be divided among those who are willing to pay the highest price for its use, the rent being applied for the general benefit of the community. Under this scheme the landlords would simply be land agents. He agreed that the owners should not be dispossessed without compensation. See George's *Life of Henry George* (1900), and Shearman's *Natural Taxation* (1895).

George, STEFAN (1868), German writer, born in Rhenish Hesse, was, with Hugo von Hoffmannsthal (1874), leader of the Neuromantiker, who stated their programme in the first issue of their organ, *Blätter für die Kunst* (1892). George has done some noteworthy work in *Die Fibel* (1901); *Hymnen, Pilgerfahrten, Algalal* (ed. 1899); *Die Bücher der Hirten- und Preis-gedichte* (ed. 1899); *Das Jahr der Seele* (ed. 1904); and *Der Teppich des Lebens* (ed. 1904).

Georges, MARGUERITE JOSÉPHINE WEYMAR, known as MOLLE. **GEORGES** (1786-1867), French actress, born at Bayeux, made her debut at the Théâtre Français in Paris in 1802. In 1808 she was in St. Petersburg, in 1812 in Dresden, and in 1816 in London. After that she became the chief delineator of the new romantic drama in Paris. Her most successful rôles were those of Clytemnestra, Dido, Semiramis, Joan of Arc, Lucretia Borgia, and Mary Tudor. Early in life she had an intrigue with Napoleon.

Georgetown. (1.) Town and episc. see, capital (formerly Stabroek) of British Guiana, at the mouth of the Demerara R. The streets are broad and lined with

trees, and through the larger ones run channels, in which grow the *Victoria regia* and other aquatic plants. There are some fine buildings, such as the Roman Catholic cathedral, the Anglican cathedral, and the government buildings. The town also contains good botanical gardens. A sea-wall a mile long protects the town from the waves, and serves as a promenade (the 'Ring'). The swampy nature of the surrounding country renders the climate very unhealthy. Anchorage in the harbour is good. Sugar, gold, timber, and small quantities of balata (very like gutta-percha), cocoa, coffee, etc., are shipped. Pop. (1891) 53,176; whites about 5,000. (2.) Capital, Penang I., Straits Settlements; stands on the N.E. coast of the island. (3.) Town, Cape Colony, cap. district of George, 120 m. N. of Swellendam. It is laid out according to the old Dutch model. Pop. of dist. 10,086; of tn. 3,666.

Georgia, a country of Transcaucasia, was in ancient times called Iberia, and was under the rule of petty chieftains. In the middle ages the kingdom received the name of Georgia or Gruzia. The Georgians, however, called themselves Kartli, after the legendary founder of their race, Kartlos, reputed sixth in descent from Noah; and a tradition ascribes the building of their old capital, Mtskhet, to Mtskhetos, son of Kartlos. Vakhtang, of the Sassanid dynasty (265 to end of 6th century), conquered Mingrelia and Abkhazia, seized Erzerum, and in 455 founded Tiflis, which became the capital in 499. In 787 the Bagratid dynasty came to the throne after the Guramids; and under Bagrat III., who had been king of Abkhazia, the Georgian kingdom extended from the Black Sea to the Caspian. Another great king was David II. (1089-1130), who drove out the Seljuks, and raised Georgia to the height of its power. Under Queen Tamara, daughter of George III., who came to the throne in 1184, Georgia enjoyed twenty-eight years of unexampled prosperity. Her armies defeated the Turks and overawed the Persians. Centuries of rapid decline and continued disaster followed. Timur twice invaded the country, and Turks and Persians devastated it alternately. Alexander contributed to its downfall in 1442 by dividing Imeritia, Kartli, and Kakhetia among his three sons. Irakli II. threw a last gleam of glory over the dynasty by his heroic struggles. After accompanying Nadir Shah to India, he returned to rule over the reunited provinces of Kartli and Kakhetia, which for a short period enjoyed comparative peace and prosperity;

but in 1783 he put his territories under the protection of Russia. Their downfall was completed by Aga Mohammed Shah of Persia, who in 1795 stormed Tiflis, massacring or taking away captive a large number of the inhabitants. Georgia was annexed (1802) to the Russian empire, and now forms the Russian governments of Tiflis and Kutais, under which heads their geographical features are described.

The Georgians proper number about 400,000, and the highland Georgians (Khevsurs, Pshavs, and Tushes), Imoritians, Gurians, Mingrelians, Lazos, etc., make up the total to about a million. The Georgian languages are in structure intermediate between the agglutinative and inflectional types. Christianity was introduced into Georgia in the end of the 3rd century; and the earliest specimens of Georgian literature are translations of the Scriptures and the theological works. The most flourishing period of literature was the reign of Tamara (1184-1212), when Rostaveli wrote *The Man in the Panther's Skin*. Shavteli enjoyed a still greater reputation. Towards the end of the 17th century Prince Sulkhan Orbeliani wrote his *Journey through Europe* and other works, and early in the next century King Vakhtang VI. compiled a code of laws which remained in force until 1841. His son, Prince Vakhushti, composed a history and a geography of Georgia. Of recent writers, the princes Ili Chavchavadze and Ivan Machabeli deserve mention. See Julius von Klaproth's *Travels in the Caucasus and Georgia* (1814); Von Thielmann's *Journey in the Caucasus* (Eng. trans. 1875); M. F. Brosset's *Histoire de la Géorgie* (1849-58); G. Leist's *Georgien, Natur*, etc. (1885); Oliver Wardrop's *The Kingdom of Georgia* (1888).

Georgia, one of the S.E. states of the U.S.A., with an area of 59,475 sq. m. It was one of the thirteen colonies and an original state. On the E. it borders on the Atlantic, and this coast region, with the entire S. part of the state, is low and level. The land rises gradually northward, and becomes more broken. Into the N. part of the state projects the S. end of the Appalachian mountain system, with summits from 3,000 to 4,000 ft. in height (highest peak, Sitting Bull Mountain, alt. 5,046 ft.). The principal rivers are the Savannah, on the boundary with S. Carolina, the Altamaha and the Chattahoochee on the W. boundary, and the Ogeechee, flowing S.E. to the Atlantic. Except where cleared for cultivation, the land is timbered; and though much has been cut,

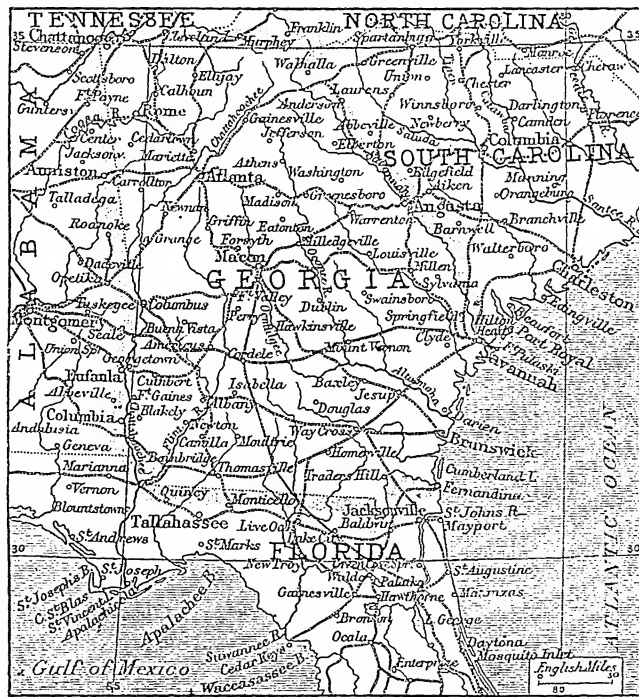
the forests still contain vast amounts of valuable timber, chiefly pine. The capital and chief city is Atlanta, in the N. part. The principal port is Savannah, near the mouth of Savannah R.

The principal industry is agriculture, chiefly the cultivation of cotton and maize. The principal products of manufacturing industry are cotton goods, lumber, flour, cotton-seed oil, cotton seed and cake. The chief mineral wealth consists of iron ore, which is mined to the amount of nearly 250,000 tons annually. A small amount of gold is also obtained from placers and veins, as well as

mainland of British Columbia, Canada. It is connected with the Pacific by Queen Charlotte Sound to the N., and Juan de Fuca Strait to the S. Length, 250 m.; breadth, averaging 25 m. It receives the Fraser R.

Georgian Bay, the N.E. division of Lake Huron, Ontario, Canada. It is about 120 m. long by 50 m. wide. A peninsular extension of the province of Ontario (Saugeen) and Great Manitoulin I. partly cut it off from the main body of the lake.

Georgievsk, dist. tn. in Terek prov., N. Caucasia, Russia, 23 m. N.E. of Pyatigorsk station. Pop. (1897) 10,608.



Georgia.

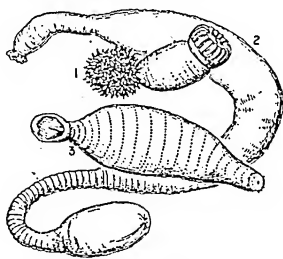
granite, marble, limestone, coal, and bauxite. Nearly half the manganese obtained in the United States is produced by Georgia. The population in 1900 was 2,216,331. Foreign-born formed only 0.6 per cent. of the population, while negroes numbered 1,034,998, or not less than 46.7 per cent. Among the higher educational institutions are the University of Georgia at Athens, the Mercer University at Macon, the Oglethorpe University at Atlanta, and the Atlanta and Clarke Universities, both at Atlanta.

Georgia, GULF or STRAIT OF, separates Vancouver I. from the

Georgswalde, tn., Bohemia, Austria, on the Saxony frontier; manufactures linen. Pop. (1900) 8,131.

Gephyrea, a name formerly given to a class of worms which included three families: (1) Priapulidae; (2) Sipunculidae; (3) Echiuridae. The three families have little in common, and the class Gephyrea has ceased to exist in strict systematic zoology. Probably the Echiuridae are related to Chetopods; the relation of the other two to each other, and to worms in general, remains uncertain. The beautiful green *Bonellia viridis*

of the warmer parts of Europe is an example of the Echiuridae. In deep water off the coasts of Britain occurs *Priapulius*, an example of the Priapulidae, while certain of the Sipunculidae—e.g. *Phascolosoma*—are not uncommon in British seas. The sipunculids present considerable superficial resemblance to holothurians, with which they were formerly confused.



Gephyrea.
1. *Priapulius caudatus*. 2. *Sipunculus nudus*. 3. *Echiurus Pallasi*.

Gepidae, an ancient people, first known in history as settled near the south-eastern shore of the Baltic. It is uncertain if the Gepidae were Goths, though closely connected with them politically. In the 3rd century, together with the West and East Goths, they made inroads into Moesia and Thrace. In the 5th century, with the Vandals and Burgundians, they moved into Italy, but were defeated in 406 by Stilicho. They were conquered by Attila; but on his death (453) they occupied Hungary and Transylvania. It was to check their power that Justinian invited the Lombards to occupy the Roman provinces between the Danube and the Alps. Conquered by the Lombards and Avars, the Gepidae were gradually extirpated, and their lands seized by the Avars.

Gera, tn., Germany, cap. of the principality of Reuss the Younger, lies in the valley of the White Elster, 45 m. by rail s.w. of Leipzig, with large woollen factories, iron works, manufactories for accordions, concertinas, etc., tobacco and cigars, leather, and machinery, besides dyeing, printing, brewing, and gardening. The chief edifices are the prince's residence, the town hall, and a museum. Pop. (1900) 45,634.

Gerace, episc. city, Italy, prov. Reggio di Calabria, stands on a spur of the Apennines, 60 m. by rail N.N.E. of Reggio. Close by stood the ancient city of Locri. Gerace is noted for its wine. Pop. (1901) 10,572.

Geraldton, munic. tn. in W. Australia, on Champion Bay, about 250 m. N. of Perth. It is the port for the Murchison gold-field. Pop. (1901) 2,458.

Geraniaceæ, a natural order of more or less aromatic plants, whose flowers have five imbricate, persistent sepals, five petals, ten stamens, and a beaked fruit dividing into five one-seeded capsules. Among the genera are Geranium, Pelargonium, Erodium, and Tropæolum.

Geranium, a genus of hardy plants belonging to the order Geraniaceæ. The so-called geranium of British green-houses is really a pelargonium. A number of species are natives of Britain, among others being *G. sanguineum*, a rather rare plant growing in limestone districts; *G. pratense*, the meadow crane's-bill, with purple flowers in summer; the very common *G. robertianum*, the herb-robert, with reddish, hairy stems and pink flowers of much beauty; *G. lucidum*, a small wall-plant with pink flowers; and the dove's-foot crane's-bill, *G. molle*, with downy stems and leaves, and rose-coloured flowers.

Gerar (Gen. 10:19; 20:1, 2; 26:1-26, etc.), a place where Abraham and Isaac dug 'pits,' in the Philistine country. It is noticed on monuments in 1600 B.C., and was on the great water-course east of Gaza.

Gérard, ETIENNE MAURICE, COUNT (1773-1852), French commander, born at Damvilliers, Lorraine; saw service under Dumouriez and Jourdan, and became famous by a splendid charge at Austerlitz. He gained fresh laurels at Jena (1806), Erfurt (1806), and, above all, at Wagram (1809). In Spain he took an important part in the battle of Fuentes de Oñoro (1811). In Napoleon's Russian expedition he rendered great service to France; as also at the battles of Bautzen and Leipzig in 1813, and in the campaign of 1814. Appointed minister of war by Louis-Philippe after the revolution of 1830, he filled the post once more in 1834. In 1831-32 he expelled the Dutch army from Flanders, and forced Antwerp to surrender.

Gérard, FRANÇOIS PASCAL, BARON (1770-1837), French painter, born at Rome, but studied at Paris under David. After obtaining the second Prix de Rome (1789), he became more widely known through his *Bélisaire* (1795) and *L'Amour et Psyché* (1797). A portrait of Madame Bonaparte (1799), followed by portraits of Madame Récamier, Madame de Staël, Napoleon, Talleyrand, and others, placed him in the foremost rank of contemporary portrait painters. Among the most important of his historical paintings are *La Bataille d'Austerlitz* (1810) and *Entrée de Henri IV. à Paris*

(1814). See Adam's *L'Œuvre du Baron F. Gérard* (1852-7); also *Correspondance de F. Gérard* (ed. H. Gérard, 1867).

Gerard, JOHN (1545-1612), English writer on gardening, born at Nantwich, Cheshire. He was a surgeon, and lived at Holborn, London, where he had a large physic garden, and for twenty years superintended Lord Burghley's garden. In 1596 he published a catalogue of the 1,100 varieties of plants in his garden, and in 1597 appeared the first edition of *The Herball or Generall Historie of Plantes*. A large part of it was directly translated from the Dutch of Dodoeus's *History of Plants*, though much of it was original. A second edition, enlarged and corrected, appeared in 1633, under the critical editorship of Thomas Johnson.

Gerardia, a genus of hardy American herbaceous plants belonging to the order Scrophulariaceæ. The flowers are usually purple or yellow, and are often large and showy. They are best raised from imported seed.

Gérardmer, health resort and mrlt. tn., dep. Vosges, France, 32 m. E.S.E. of Epinal. It is a noted tourist centre for the Vosges, and is famous for Longemer cheese. It has some linen manufacture. Pop. (1901) 8,075.

Gérardy, JEAN (1877), 'cellist, born at Liège; made his first appearance in Britain in 1888, on tour with MM. Ysaye and Paderewski. All over Europe he has the reputation of being one of the greatest living 'cellists.

Gerasa, now known as Jerash, ancient city of Palestine, some 20 m. E. of Jordan, in the mountains of Gilead. Sir George Grove identifies it with Ramoth-gilead. It was built by the Romans in 65 B.C., and was an important place in the 2nd, 3rd, and 12th centuries, and in early Christian times was made a bishop's see. The ruins at Jerash are those of a large Roman town of the 2nd century A.D., which are second only to Palmyra in importance. See GADARA.

Gerber, ERNST LUDWIG (1746-1819), German historian of music, born at Sondershausen; in 1775 he succeeded his father there as court organist. He is chiefly remembered as the author of *Historisch-biographisches Lexikon der Tonkünstler* (2 vols. 1790-92), which he added to and republished in four volumes under the title of *Neues historisch-biographisches Lexikon* (1812-14). There is an English version—*A Dictionary of Musicians* (1827).

Gerber, KARL FRIEDRICH WILHELM VON (1823-91), German jurist and statesman, a native of Schwarzburg-Sondershausen.



Common British Geraniums.

1. *Geranium robertianum*. 2. *G. columbinum*. 3. *G. molle*. 4. *G. rotundifolium*. 5. *G. pratense*. 6. *G. sanguineum*. 7. *G. lucidum*.
8. *G. dissectum*. 9. *G. pyrenaicum*. 10. *G. pusillum*. 11. *G. phaeum*. 12. *G. sylvaticum*.

He held professorships at Jena (1846), Erlangen (1847), Tübingen (1851), and Leipzig (1863), and was the author of *System des deutschen Privatrechts* (1848-9), many editions; *Zur Charakteristik der deutschen Rechtswissenschaft* (1851); *Grundzüge eines Systems des deutschen Staatsrechts* (1865); *Gesammelte juristische Abhandlungen* (1872). From 1871 till his death he was Saxon minister of ecclesiastical affairs and public instruction.

Gergeh, or GUERGA, prov. of Upper Egypt. Area, 631 sq. m. Pop. (1897) 688,011.

Gerhard, FRIEDRICH WILHELM EDUARD (1795-1867), German archaeologist, born at Posen; became professor at Posen, but gave up the post to travel in Italy (1819). During fifteen years spent at Rome he carried on archaeological researches, materially aided by the excavations begun by Lucien Bonaparte (1828). He contributed to the *Beschreibung der Stadt Rom* of Platner and Bunsen, and took a prominent part in the foundation of the Archaeological Institute at Rome. Appointed archaeologist at the Royal Museum, Berlin (1837), he became professor at the university there (1844). He was the author of *Antike Bildwerke* (1827-44), *Etruskische Spiegel* (1843-68), *Etruskische und Campanische Vasenbilder* (1843), and *Apulische Vasen* (1846). See *Memoir* by O. Jahn (1868).

Gerhardt, DAGOBERT VON (1831), German author and poet, known under the pseudonym of Gerhard von Amyntor, born at Liegnitz in Silesia; took an active part in the war with Denmark (1864) and the war with France (1870-1). His first poems of note were *Peter Quidams Rheinfahrt* (1878) and *Liedern eines Deutschen Nachtwächters* (1878). His most popular books have been two series of *Hypochondrische Plaudereien* (1875 and 1883), *Frauenlob* (1885); and the novels, *Eis-moll Sonata* (16th ed. 1899) and *Gewissensqualen* (12th ed. 1894). In 1903 he published *Ein Kampf um Gott*, and in 1893-8 he published *Das Skizzenbuch meines Lebens*.

Gerhardt, KARL FRIEDRICH (1816-56), German chemist, born at Strassburg; studied under Liebig at Giessen. Going to Paris, he published there, in collaboration with Cahours, a memoir on essential oils, embodying new theories, which brought him into prominence. A professorship at Montpellier (1844-8) was followed by several years' residence in Paris. He brought new light to bear upon chemistry rather by determining the relation of facts already known than by the discovery

of new facts. His conclusions upon the order of organic compounds, with the theory of 'homologous and heterologous series,' mark an epoch in the history of chemistry. His *Précis de Chimie Organique* (1844-5), and especially his *Traité de Chimie Organique* (1853-6), comprise the results of his research. In 1855 he was appointed professor of chemistry at Strassburg. See Cahours's *Notice sur Charles Gerhardt* (1856).

Gerhardt, PAUL (1607-76), German hymn-writer, born in Saxony; held ecclesiastical appointments at Mittenwalde, near Berlin (1651), and in Berlin (1657-67). From 1669 until his death he was pastor at Lübben in the Spreewald. He is the foremost writer of German hymns in the 17th century. They are inspired by true faith in God and the Lutheran cause and by a wondrous contentment. His hymns have been well edited by Karl Gerok (4th ed. 1890). Among the best known are: *Nun ruhen alle Wälder* (1648); *Wach auf mein Herz, und singe* (1648); *Warum sollt ich mich denn grämen* (1653); *Befehl du deine Wege* (1656), of which Wesley's version ('Commit thou all thy ways') is familiar; *O Haupt voll Blut und Wunden* (1656). His *Life* has been written by E. G. Roth (new ed. by S. Lommatsch, 1893), and by A. Stein (1897).

Géricault, JEAN LOUIS ANDRÉ THÉODORE (1791-1824), French painter, born at Rouen; the pupil first of Carle Vernet, and afterwards of Guérin. He holds an important position in the history of French art as the precursor of romanticism. His great work, *Le Radeau de la Méduse*, provoked much opposition, but influenced many of the younger men, and notably Delacroix. It now hangs in the Louvre. Others are to be found there, and in the provincial museums of France; and his water-colour, *Equestrian Portrait of the Prince Regent*, is in the Wallace Collection, London. See Clément's *Géricault* (1868; 3rd ed. 1879).

Gering, ULRICH (c. 1440-1510), Swiss printer, born probably at Lucerne; went to Paris (1469), in response to the invitation of the professors of the Sorbonne. The first book issued by him in Paris was the *Gasparini Pergamensis epistolarum liber* (1470), followed by editions of the classics, theological works, and lighter literature.

Gerizim and Ebal, hills of Samaria, Palestine. The former (alt. 2,849 ft.) stands s. of the latter (228 ft. higher), in 31° 12' N. and 35° 16' E., and is separated from it by the narrow pass of Gerizim, in which is situated the

town of Nablús (Neapolis), the ancient Shechem. Gerizim was chosen as the mountain of blessings, Ebal as that of cursings, in the time of Joshua (Joshua 8:33). The Samaritans built their temple on the former.

Germ. See EMBRYOLOGY; BACTERIOLOGY.

German, EDWARD (1862), English musical composer, born at Whitechurch in Shropshire. His incidental music to Shakespearean plays—*Richard III.* (1889), *Romeo and Juliet* (1895), *Henry VIII.* (1892), *Much Ado about Nothing* (1898)—showed qualities that fitted him to finish *The Emerald Isle* for the Savoy after Sullivan's death (1900). *Merric England* was well received there in 1902, and *A Princess of Kensington*, produced in the following year. His suites, symphonies, and songs enjoy wide popularity; and an early work, *The Rival Poets*, was revived at the Royal Academy of Music (1901). In 1904 he produced the *Just so Song Book* with Rudyard Kipling.

German Catholics, a religious sect that broke away from the Church of Rome in Germany in 1844 under the leadership of Ronge and Czerski, both ex-priests, who had formed a congregation of 'Christian Apostolic Catholics' at Schneidemühl. But the two founders agreed in little more than their protest against Rome, Ronge being an advanced rationalist, and Czerski an evangelical Protestant. The first general council of the 'German Catholics,' held at Leipzig in 1845, substantially adopted the Breslau confession, and most of the congregations—which had by then increased to over 170, with more than 40,000 adherents—followed it. Internal dissension at once set in, and they were expelled from Austria, and their clergy were not recognized in Prussia. After 1848 many of the congregations dissolved, others returned to Rome, and the majority in 1859 joined with the (rationalistic) 'Free Congregations' that had developed out of Protestantism. By 1900 the numbers of the rigid German Catholics had dwindled down to little more than 2,000, all in the kingdom of Saxony. See Kampe's *Geschichte der Deutschkatholicismus* (1860); and Findel's *Der Deutschkatholicismus in Sachsen* (1895).

Germander, a name sometimes given to plants belonging to the genus *Teucrium*, a subdivision of the order Labiate. The upper lip of the corolla is very short and deeply two-cleft. The wood germander (*T. scorodonia*) is a common native plant, with bitter, wrinkled, sagelike leaves, and small greenish flowers.

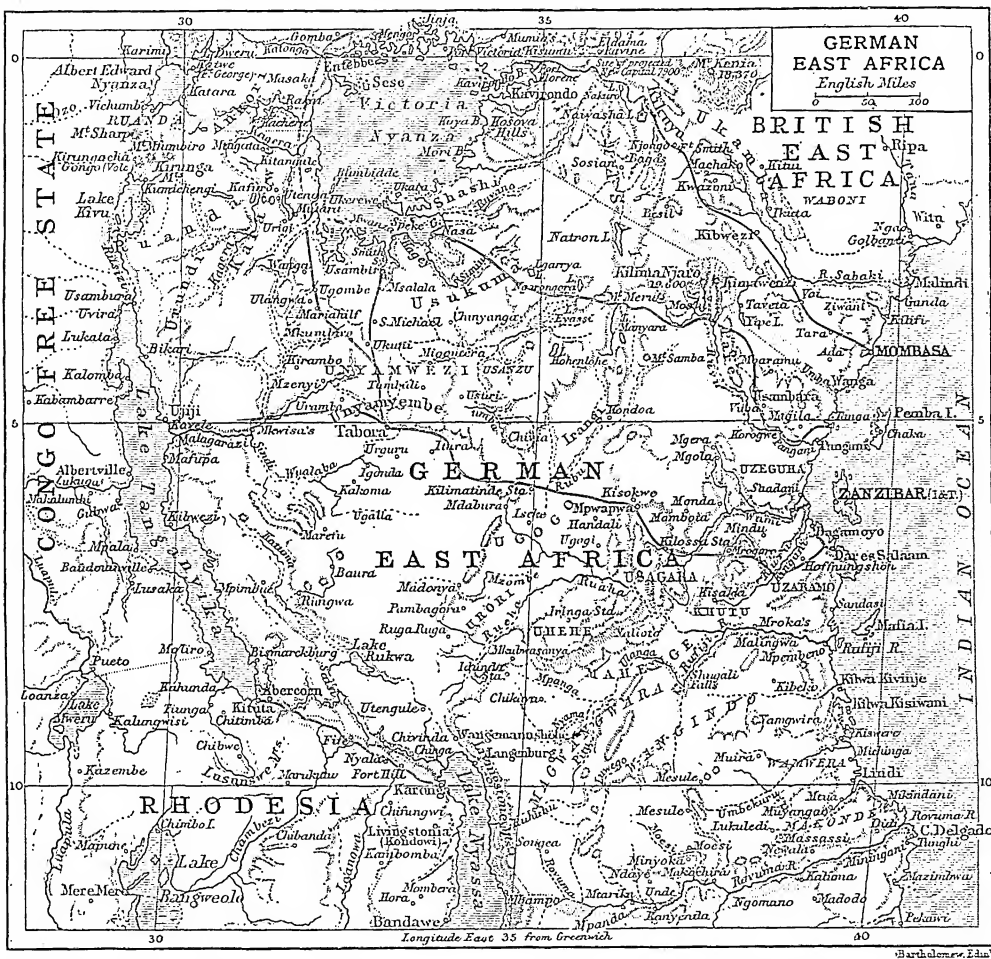
German East Africa, bounded on the E. by the Indian Ocean, stretches from 1° to nearly 12° S., and from 29° 30' to 40° 15' E. Its sea coast is 620 m. long. The total area is given officially as 363,270 sq. m. The coast is low-lying and monotonous. Behind it is a hill-land, which merges westwards into higher and more plateau-like country. Thin forest is widespread, and, in general,

Kingani, Rufiji (navigable 124 m. for four months of the year), Umbekuru, and Rovuma. The W. drainage includes the Simiyu and Kagera (ultimate *caput Nili*), draining into Victoria Nyanza; the Malagarazi into Tanganyika; the Songwe into Rikwa; the Ruhuhu into Nyasa.

On Victoria Nyanza the maximum temperature is 88°, the minimum 50°. In the interior the tem-

perature ranges from 113° to 46°. The rainfall for the year ending 30th June 1901 was—at Pagan, 50 in.; at Kwankoro, 102 in. On the coast grow the mangrove, baobab, and tamarind. Thick forests of sweet apples, tamarinds, and melons crown the highlands. Coffee grows wild. Most widely cultivated is sorghum; next come maize and bananas (in the interior), manioc and batatas (on the coast). The population is

mostly Bantu; along the coast are Arabs, Baluchis, Indians, Goanese, Syrians, and Swahilis. The Swahili tongue is the *lingua franca* of E. Central Africa. For centuries the interior has been subject to Arab influence from the coast, Zulu forays from the S., and Nilotic Negro and Hamitic encroachments from the N. August and September 1905 saw the beginning of a native rising.



there is a preponderance of pastoral and arable land. The mountain mass guarding the N. frontier is 1,455 sq. m. in area, and culminates in Mt. Kilimanjaro (19,680 ft.). The Livingstone Range, nearly 10,000 ft. in height, rounds Lake Nyasa on its N. and E. sides. To the W. lies the hilly table-land of Unyamwezi, including the populous Unyamwebe. The E. drainage includes the rivers Pangani, Wami and

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The principal port on the E. coast is Dar-es-Salaam. Exports (1903) £497,500; imports, £943,300. The exports consist chiefly of rubber, copra, ivory, and coffee. The colony is administered by an imperial governor. In 1902 the native and non-European population numbered 6,853,700, and in 1905 the European population, 1,873.

Under Vasco da Gama the Portuguese began in 1498 to re-

Germania

duce the coast towns, but in 1698 the imam of Muscat dislodged the Europeans. In 1884 Dr. Peters, the German emissary, claimed treaty rights over Uzeguha, Ukami, Usagara, and Uguru—rights straightway clinched (1885) by imperial protection. The present boundaries were successively determined by agreement with the Congo Free State (1885), with Portugal (1886), with Great Britain (1886, 1890, and 1906). In 1890, in consideration of an indemnity of £200,000, the sultan of Zanzibar waived all his sovereign rights over the mainland and the island of Mafia in favour of Germany. See *Deutsch-Ostafrika* (8 vols. 1893-1902).

Germania, a name applied in Roman times to the country bounded by the Rhine on the w., the Baltic on the n., the Vistula and the Carpathian Mts. on the e., and the Danube on the s. Its inhabitants are described as a people of great stature and strength, with fair complexions, blue eyes, and yellow hair. Many of their tribes were nomad; their chief occupation was war; and they were ardently attached to liberty. They held their women, noted for their chastity, in high honour. The people were divided into four classes—nobles, freemen, vassals, and slaves; a king was elected from among the nobles, but his authority was limited. The Romans waged frequent wars with the German tribes: first with the Cimbric and Teutones, whom Marius destroyed in 102 and 101 B.C.; then Julius Caesar fought against them between 58 and 53 B.C.; and Drusus between 12 and 9 B.C. In 9 A.D. the Germans under Arminius (Hermann) annihilated Varus's army; and this practically decided the emperors not to attempt the conquest of Germany, though Germanicus carried on some successful campaigns against them, but was recalled in 17 A.D. In later times Germans often entered the Roman armies, and finally they invaded the empire. Foremost among these invaders were the Alemanni and Franks or Franks, the latter of whom conquered N. Gaul. Tacitus's *Germania* is the chief ancient authority.

Germanicus, CAESAR (15 B.C. to 19 A.D.), was the son of Nero Claudius Drusus, and nephew of the Emperor Tiberius, by whom he was adopted, and whom he assisted in his campaigns against the Pannonians and Dalmatians (7 to 10 A.D.), and against the Germans (11 and 12 A.D.). In 14 A.D. he quelled the mutinous troops on the German frontier and in Illyricum; but Tiberius recalled him in 17 A.D. After a visit to Egypt, Germanicus died

in Syria in 19 A.D. Germanicus was married to Agrippina the elder, and among his children were the Emperor Caligula and the younger Agrippina.

Germanium (Ge, 72.5), a metallic element of the silicon group, discovered by C. Winkler in 1885, in a silver ore called argyrodite. It is prepared by reducing the oxide obtained from argyrodite,

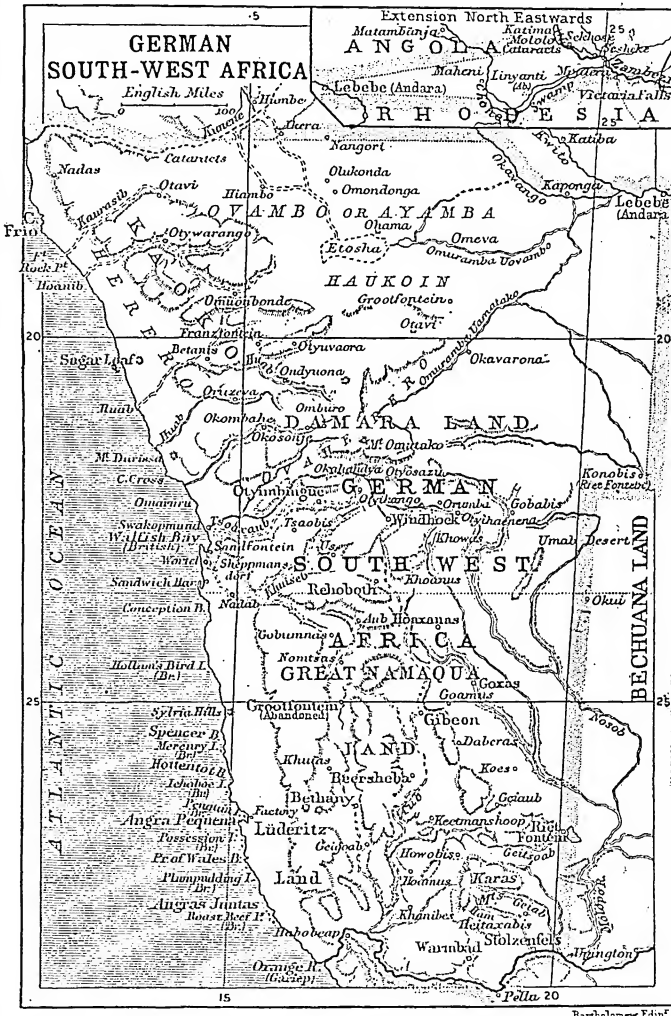
portant of which is the dioxide, GeO_2 , which has acid properties, and the halides—e.g. GeCl_4 —which are volatile.

German Ocean. See NORTH SEA.

German-Reed Family. See REED.

German Silver, or NICKEL SILVER, an alloy of somewhat variable composition, but con-

German Silver



either by charcoal or by hydrogen, and is a gray-white, brittle, crystalline, and somewhat infusible metal, that retains its lustrous appearance in air at ordinary temperatures. Chemically, it is intermediate in properties between silicon and tin, being the ekasilicon predicted by Mendeleeff. It is tetravalent in most of its compounds, the most im-

sisting approximately of copper 6 parts, zinc 3, and nickel 1. It forms a white, tough metal that takes a good polish, and is suitable for the manufacture of spoons, forks, and similar articles; but as it soon tarnishes, it is usually electro-plated. German silver has a high electrical resistance, and is largely used for making resistance coils.

German South-west Africa is bounded on the w. by the Atlantic, and on the s. by Cape Colony, and has an area of 322,450 sq. m. Mainly a plateau, the land falls seaward in terraces, gentle slopes, or sandhills, and rises from 1,300 ft. above sea-level near Walfish Bay to 5,300 ft. at Windhoek, 186 m. inland, falling thence in gentle inclines eastwards to the Kalahari desert. The s. part and much of the e. is barren and desert. None of the numerous coast streams are permanent, except the Orange on the s. frontier, and the Cunene and Okavango on the N., the last mentioned flowing E. to the Zambesi, the others to the coast.

Vegetation is particularly rich in the Okavango valley, with its dwarf palms and papyrus. In Ovamboland maize and Kafir corn are grown. In Damaraland and Namaqualand agriculture is dependent on irrigation. A little gold occurs in the northern districts, and copper, asbestos, and graphite have been found. The natives of Damaraland own vast herds of cattle. A new harbour has been constructed at Swakopmund, from which place a railway (237 m.) runs to Windhoek. Imports (1903), £387,000; exports, £168,000, chiefly guano, wax, and feathers.

The seat of administration is Great Windhoek. German occupation dates from 1884. Population: natives (Hereros, Ovambos, Damaras, Namas, etc.), 180,000; whites (1902), 4,682, including military. Towards the close of 1903 a rising of Hereros and other tribes took place. During 1904 a German punitive expedition suffered several reverses, and large reinforcements became necessary. Although the Germans inflicted defeats upon the Hereros, they were unable to suppress the rising, and were severely harassed by the elusive guerilla tactics of the enemy. Active operations were still in progress in the summer of 1906, though the back of the native resistance was broken. The rising had in July 1905 already cost 1,100 German lives and £12,500,000.

Germantown, now the N. suburb of Philadelphia, Pennsylvania, U.S.A. Here the first paper mill in America was erected, and the first American edition of the Bible printed; and here, on Oct. 4, 1777, Washington was repulsed by the British under Howe.

Germany, or the GERMAN EMPIRE, lies between the Baltic Sea, Denmark, and the North Sea on the N., and Switzerland and Austria-Hungary on the s. The greatest length, measured from near Memel in the N.E. to beyond Mülhausen in the s.w., is

330 m., and the shortest, from Swinemünde at the mouth of the Oder to beyond Bautzen in the (Saxon) Lausitz, 196 m. The states of the empire, together with their areas, their populations in 1871 and 1905, and their several densities, are shown in the following table:—

State.	Area in sq. m.	Pop. 1871.	Pop. 1905.	Density, 1905.
Kingdom of Prussia.....	134,636	24,691,433	37,278,820	277
" Bavaria.....	20,288	4,863,450	6,512,824	222
" Saxony.....	5,790	2,556,244	4,502,350	777
" Württemberg.....	7,535	1,818,530	2,300,330	305
Grand-Duchy of Baden.....	5,823	1,461,562	2,009,320	345
" Hesse.....	2,966	852,804	1,210,104	407
" Mecklenburg-Schwerin.....	5,069	557,807	624,881	123
" Mecklenburg-Strelitz.....	1,131	96,082	103,251	91
" Saxe-Weimar....	1,397	280,183	387,892	277
" Oldenburg.....	2,482	314,459	438,195	176
Duchy of Brunswick.....	1,418	311,764	485,655	342
" Saxe-Meiningen.....	953	187,957	268,859	282
" Saxe-Altenburg.....	511	142,122	206,500	404
" Saxe-Coburg-Gotha....	764	174,339	242,292	317
" Anhalt.....	888	203,437	328,007	360
Principality of Schwarzburg-Sondershausen.....	333	67,101	85,177	256
" Schwarzburg-Rudolstadt....	363	75,523	96,830	266
" Waldeck.....	433	56,224	59,135	136
" Reuss, Elder Line.....	123	45,094	70,500	574
" Reuss, Younger Line.....	319	80,032	144,570	453
" Schaumburg-Lippe.....	131	32,059	44,902	343
" Lippe.....	469	111,135	145,610	310
Free and Hanse Town Lübeck....	115	52,158	105,857	946
" Bremen.....	99	122,402	263,426	2660
" Hamburg..	160	338,074	875,000	5469
Imperial Territory—Alsace-Lorraine.....	5,004	1,549,738	1,814,626	323
Total.....	208,810	41,058,792	60,005,183	290

In 1890 the island of Heligoland was ceded by Great Britain to Germany.

Coasts.—The E. shore of Schleswig-Holstein is moderately high, and pierced by several deep, narrow inlets (*fjörden*) or fjords—*e.g.* Flensburg, Eckernförde, Kiel. The N. coast, belonging to Mecklenburg and Prussia, is uniformly low, and but little indented, save for the wide bays of Lübeck, Pomerania, and Danzig. But the great rivers (Oder, Vistula, and Memel or Niemen) which reach the Baltic along this coast have formed at their mouths extensive shallow lagoons or *haffs*—*e.g.* the Stettiner Haff, the Frisches or Fresh Haff, and the Kurisches or Courland Haff, each separated from the sea by a long narrow dune or spit of sand (*nehrung*). Islands are few—Usedom and Wollin, Rügen, Fehmarn and Alsen. The coast of the North Sea is everywhere low and sandy. Both the E. Frisian Islands (Norderney, etc.) and the N. Frisian Islands (Nordstrand, Pellworm, Föhr, Sylt, Röm) have for centuries been

crumbling away. On the mainland the marshy strips along the seaboard and up the lower courses of the rivers (Elbe, Weser, and Ems) are probably the most fertile regions in all the empire. But they are backed by some of the most infertile, known as the Geest, which is in great part

overgrown with heath, and by the Lüneburg Heath, the greatest moorland in all Germany.

Configuration.—Physically Germany is divisible into two strikingly contrasted regions—(1) the great N. German plain, and (2) the mountainous and hilly region of Central and Upper Germany. The former stretches from the frontier of Holland to the frontier of Russia. It does not, however, form a uniformly inclined plane, but is diversified by two well-marked ridges or swellings. The more northerly of these, the Baltic ridge of heights, exhibits in its direction a close parallelism with the shore of the Baltic. Its elevation is from 300 ft. to 1,000 ft., the maximum being the Turmberg, near Danzig (1,085 ft.); and it is throughout thickly studded with lakes, especially in Mecklenburg (Schwerin, Plau, Müritz, Malchin, Kummerow, Tollense see) and in E. Prussia (Spirding, Löwentin, Mauer, Dargainen). The other ridge, farther to the s., marks off the Lüneburg Heath, the

Fläming (between the Oder and the Elbe), and the Katzenberge and the Trebnitz Hills (on both sides of the Oder), and ranges from 500 to over 1,000 ft. in altitude. The space between these two ridges is to a great extent occupied by the Oder-Havel-Spree depression, with numerous lakes and marshes. Recent investigations (Berendt, Wahnschaffe, Keilhack) go to show that towards the end of the third glacial epoch three large rivers were successively formed along the edge of the ice sheet as it slowly receded northwards. These streams, flowing N.W. and W. from the direction of Glogau, Warsaw, and Thorn respectively, united with the Elbe in a common confluence between the sites of Magdeburg and Wittenberge. Subsequently, when the ice sheet had entirely disappeared, two of

for ages. Farther to the S.E., in Silesia, there are a number of small ranges—e.g. the Glatz Mountains, the Eulengebirge, the Waldenburg Mountains, irregularly grouped along the Bohemian frontier, and rising to altitudes of from 2,500 to 4,500 ft. These include the rich coal deposits which render Silesia one of the busiest industrial regions in the empire. At their S. extremities the two divisions of the Hercynian system are connected by the picturesque sandstone hills of 'Saxon Switzerland,' and by the Erzgebirge, the latter being on the German side a high plateau region with a severe climate, rising from 2,000 to 4,000 ft. in altitude. This range (for such it is on the Bohemian side) gets its name from the mineral ores (*erze*) which it contains—silver, iron, tin, copper, lead,

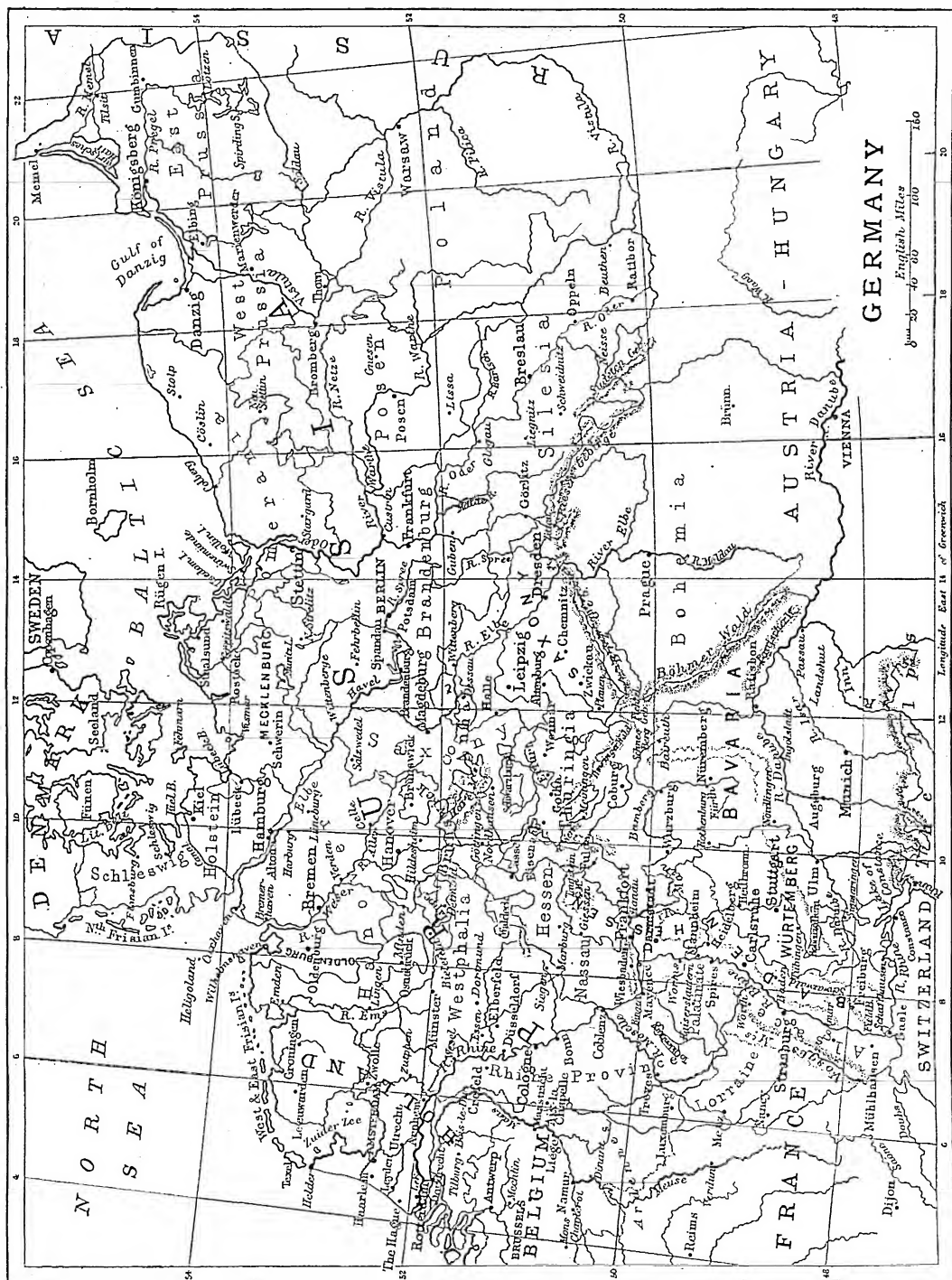
stretches S.W. as far as the Black Forest, across the upper courses of the Weser, Main, and Neckar, a vast compact mass of Triassic age, which may be described as a broken, wooded plateau; the same formation also fills up the region between the Harz, the Thuringian Forest, and the Teutoburger Forest. On the S. and E. this plateau is backed by the Swabian and the Franconian Jura, a long narrow rib (2,000 to 3,000 ft.) which separates it from the Bavarian highlands on the S. of the Danube. The whole of the country S. of the Danube is a highland region ranging from 1,300 to 3,200 ft., with its maximum elevation in the Zugspitze (9,710 ft.), the loftiest summit in the empire. It is cut by the deep torrential streams of the Iller, Lech, Isar, and Inn, all tributaries of the Danube, and by sombre (Ammer, Würm, or Starnberg) or charming (Tegern, König) lakes. The Rhine valley is shut in by the Vosges (3,000 to 4,000 ft.) in Alsace, and the Black Forest or Schwarzwald (2,400 to 4,000 ft.) in Baden—both very similar in structure and in general characteristics. Both are densely wooded, in great part with conifers; and both are trenched by deep, picturesque valleys, the seats of busy industries. They screen the Rhine valley from chilling winds, and so secure to it a warm, sunny climate. The Hunsrück (2,000 ft.) with remarkably fertile valleys which yield an abundance of wine, the Eifel plateau and its outlier the Hohes Venn (1,200 to 2,500 ft.), the Taunus range, the Westerwald, and the Sauerland Mountains (2,500 ft.) on both sides of the Rhine, form the protuberances on another massive plateau. The Taunus range (1,600 ft.) yields the most famous wines of Germany—e.g. Johannisberger, Rüdesheimer, Marco-brunner, Raenthaler, etc. In the valleys and on the slopes of the range there are a great number of mineral spas—Wiesbaden, Homburg, Soden, Ems, Schwalbach, Schlangenbad, and others. The Rhine has forced a passage through the heart of this vast Devonian plateau in a narrow, tortuous bed, which is overlung with castle-crowned crags, and over which the spirit of romance has brooded for ages. East of the Westerwald and the Taunus rise the volcanic Vogelsgebirge or Bird Mountains (2,300 ft.) and the Rhön Mountains (3,000 ft.).

Climate.—On the whole, the climate of Germany is temperate, and, considering the extent of the empire, remarkably uniform in all its parts. The highest annual mean temperature is registered in the valleys of the Rhine, Neckar,



the streams turned their courses towards the N., and shaped themselves into the modern Oder and Vistula, whilst the third shrank into the Havel-Spree chain of fluvial lakes. Diluvium clothes the higher parts, while alluvium is mostly found in the valleys, depressions, and transverse furrows. The N. German plain is backed on the S., or rather on the S.W., by the elevated region known as the Hercynian system or the Sudetic Mountains. These extend in a double line from the frontiers of Bohemia to the watershed which divides the basin of the Weser from the basin of the Ems. The most conspicuous are the Harz Mountains (2,000 to 2,800 ft.), culminating in the mist-drenched Brocken (3,745 ft.), with its wealth of weird and gloomy tradition. In this range copper, silver, and lead have been mined

cobalt, nickel, and bismuth. Both these mountains and the Bohemian Forest range meet in the mountain-knot called the Fichtelgebirge or Fir Mountains (2,500 to 3,500 ft.). The Fichtelgebirge are connected with the Thuringian Forest on the N.W. by the narrow (25 to 30 m. across) table-land of the Franconian Forest (2,000 ft.). The Thuringian Forest range, some 70 m. long, with its culminating peak the Gross Beerberg (3,225 ft.), is a scene of busy industrial activity, and shares with the Harz the attention of holiday-makers during the summer months. Still farther towards the N.W., beyond the Weser, and gradually melting into the N. German plain, is the outlying Teutoburger Forest (1,550 to 1,000 ft.), the last link of the Hercynian system. From the Thuringian Forest there



Main, and Moselle—viz. 49° to 52°. There only in the empire will maize ripen and the almond and chestnut fructify. Rain falls at all seasons: it falls in greatest quantity (35 to 55 in.) on the Harz Mountains, the Black Forest and Vosges Mountains, over the Bavarian Highlands, and on the mountain chains which separate the empire from Bohemia; and falls in smallest quantity on the north and middle zones of the N. German plain (16 to 24 in.), in Silesia, and in the upper Rhine valley.

Mining.—Coal exists in two fields in Silesia—one around Beuthen and Kattowitz; the other with its centre at Waldenburg. Another vast store is worked in Westphalia, around Dortmund, Essen, Bochum, Duisburg, Hagen, and other industrial centres. There is a third field in the basin of the Saar, between Saarbrücken and Treves; and there are smaller deposits in Saxony and the Thuringian Forest. Lignite is mined principally in three fields—(1) in the neighbourhood of Cologne and Bonn; (2) along a line running from Kaiserslautern in the Bavarian palatinate to near Hildesheim in Hanover; and (3) in the provinces of Saxony and Brandenburg. Whereas in 1876 the output of coal amounted to less than 50 million tons, in 1905 it advanced to over 173 million tons. Iron is mined principally in Alsace-Lorraine and Luxemburg, in the valley of the Lahn in Hesse-Nassau, and in the Rhine province from Bonn eastwards to Siegen in Westphalia. The total output ranges annually between 16 and 22 million tons (3½ million tons in 1876) of raw iron. Zinc is mined near Aachen and in Silesia, to the extent of between 600,000 and 750,000 tons annually. Rock salt and other mineral salts are extracted on a considerable scale in the Prussian province of Saxony (at Stassfurt, Schönebeck), Anhalt, Leopoldshall, and Württemberg (Hall, Heilbronn). The total output increased from 750,000 tons in 1876 to nearly 5,200,000 tons in 1904. Copper (800,000 tons in 1904) is mined in Prussian Saxony (Mansfeld) and Westphalia (Arnsberg); lead, with silver and gold (the last two in diminishing quantities) in the Harz Mountains and Saxony (Freiberg); lithographic stone in Bavaria (Solnhofen), and amber near Königsberg. Altogether, the total value of the mineral ores increased from 19 millions sterling in 1876 to 68 millions in 1904.

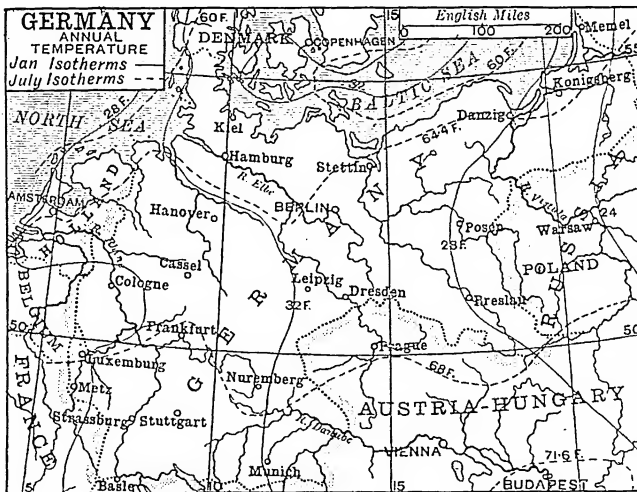
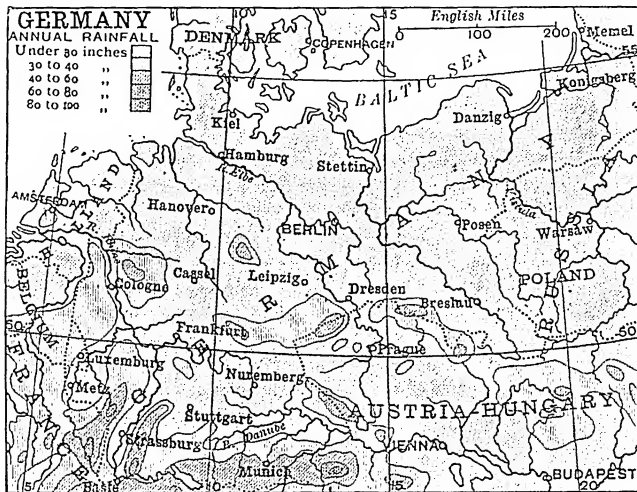
The only part of Germany in which trees are not more or less plentiful is the N.W. Altogether, about 26 per cent. of the total area of the empire is covered with

forest. The Spessart still preserves remains of the primeval oak forests of Germany.

People.—The population in 1871 and 1905 is shown in the table (p. 189). During the period 1880-93 inclusive, the emigrants abroad averaged 125,163 annually; but from 1894 to 1905 inclusive, only 26,124 annually. Out of a grand total of 2,106,377 emigrants in

in the N.E. of Prussia; Wends in Saxony, Brandenburg, and Pomerania; and Frisians.

Agriculture.—This still remains the most important industry of Germany. During the last fifteen or twenty years of the 19th century it made extraordinary progress, especially in the Prussian province of Saxony, the Mecklenburg duchies, West-



the years 1880-1904 inclusive, no less than 1,887,848 went to the United States. In 1900, 54.3 per cent. of the population were classed as urban, and 45.7 per cent. (63.7 in 1871) as rural. About 93 per cent. are of Teutonic blood; the remainder consist of Poles (3,000,000); French in Alsace-Lorraine; Bohemians; Danes in Schleswig-Holstein; Lithuanians

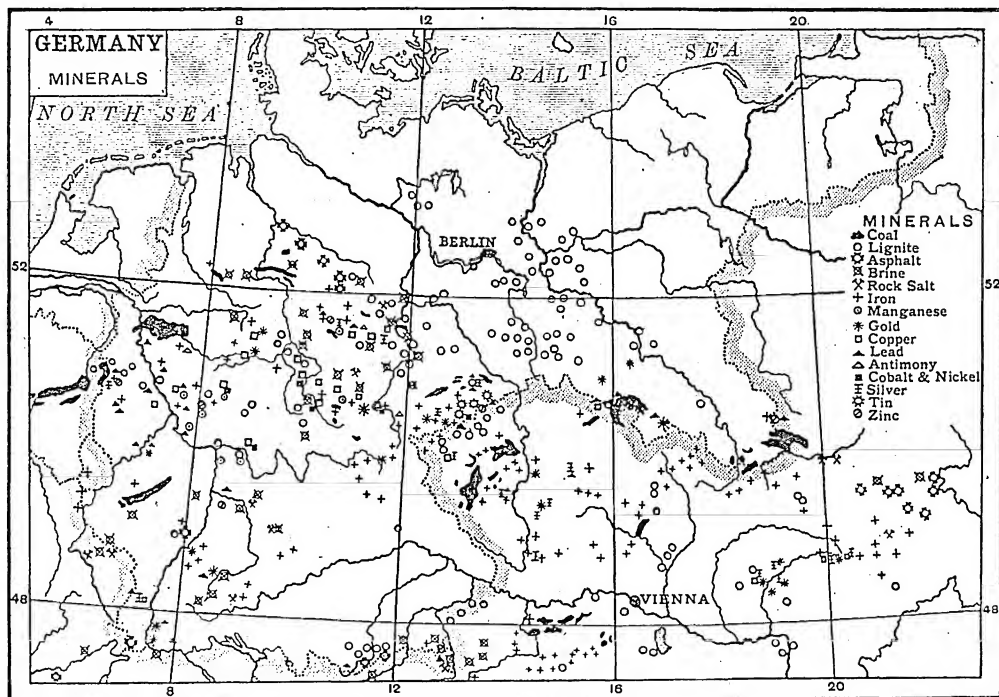
phalia, and Württemberg. One potent factor in the revolution which was effected has been the cultivation of beetroot for sugar; other factors are a thorough study of the application and effect of chemical manures upon crops and soil, a more extensive cultivation of roots generally, stall-feeding of cattle, and the use of the best modern imple-

ments. Not only has the state fostered education in the technical branches of agriculture, but it has introduced breeds of live stock, granted exceptional railway freights for agricultural produce, and spent millions of money upon the construction of new canals and the improvement of the existing waterways. The agricultural university college at Hohenheim in Württemberg is probably the best equipped foundation of the kind in existence. Similar university colleges for agriculture have been instituted at Berlin, Bonn, Breslau, Giessen, Göttingen, Halle, Jena, Kiel, Königsberg, Leipzig,

in 1903; the yield of raw sugar increased from 940,000 tons in 1884 to 1,822,491 tons in 1903-4.

What the sugar beet is to N. Germany the vine is to S. Germany. The best wine is grown in the valleys of the Rhine, Moselle, Main, and Neckar. The vine is also cultivated in the valleys of the Saale, Elbe, and Oder. Hops are extensively grown in Bavaria, and to a less degree in Württemberg, Alsace-Lorraine, and Baden. Tobacco is grown principally in Brandenburg and Pomerania, and in Baden, Bavaria, Alsace-Lorraine, and Hesse-Darmstadt. Gardening (flower seeds, bulbs, etc.) is an

deal of the progress which has been made is, however, due to the alert policy of the imperial and state governments. The iron and steel industries, which have doubled their output in the ten years 1895-1905, are concentrated in the Rhine province and Westphalia, but are also carried on at Chemnitz, Munich, and Nuremberg, Esslingen, and Stuttgart, Mülhausen, Berlin, Stettin, and Elbing. The cotton industries are conducted on the largest scale in the kingdom of Saxony, in the Rhine province and Westphalia, in Alsace, Silesia, Württemberg, Bavaria, Baden, and Berlin. The woollen industries



and Munich. But the agency to which the German farmers more especially owe the progress they have made is co-operation among themselves. Electricity is being employed for ploughing, threshing, and lighting on the large estates of Brandenburg, Pomerania, and Posen. Large sums are being spent on the drainage and reclamation of boggy moorlands, especially in Bavaria, Prussian Saxony, Hanover, and other parts. By far the greater portion of the farms are small, 94.5 per cent. being each less than 50 acres in extent. The area planted with sugar beet increased from less than 350,000 acres in 1883-4 to more than three times as much

important industry in the neighbourhood of Erfurt, Quedlinburg, and Aschersleben in Central Germany; fruit (cherries, apples, pears) is a source of considerable income in Württemberg. Bees are a source of profit in N. Germany, especially in Hanover and Anhalt.

Industry.—Since 1890 manufacturing industry has made remarkable advances, especially in those branches which depend upon practical intelligence, expert knowledge, and technical skill, and, above all, upon co-operation and discipline, as the chemical, electrical, fancy and semi-artistic, machinery, and shipbuilding industries. A great

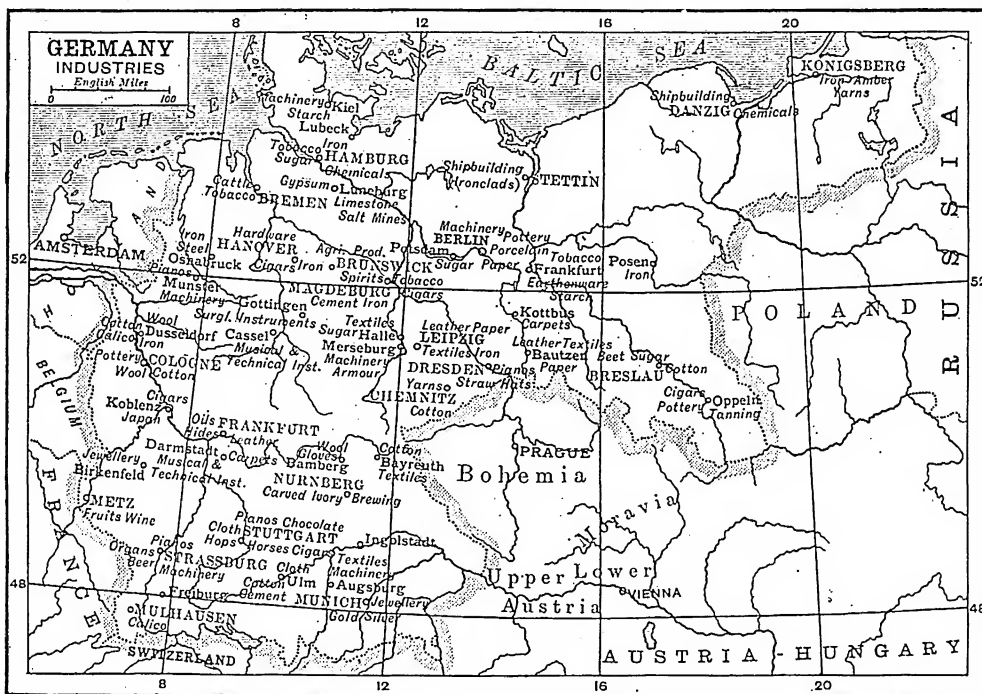
centre principally in the Rhine province, the kingdom of Saxony, Thuringia, Brandenburg, Silesia, Alsace, and at Stettin, Stuttgart, and Berlin. Hosiery is made in Saxony (kingdom), Thuringia, Bavaria, Württemberg, and Berlin. Linen manufactures are carried on principally in the provinces of Posen, Pomerania, E. and W. Prussia, Silesia, Brandenburg, Hanover, Westphalia, and the Rhine province. Silk and velvet goods are made at Crefeld and other places in the Rhine province, and at Berlin and in Baden. Hemp is spun in Württemberg and Bavaria, and jute in Brunswick, Bremen, and other towns. Bricks and earthenware are pro-

duced in Brandenburg, Pomerania, Hesse-Nassau, and Baden; porcelain and glass in Saxony (Meissen), Thuringia, Bavaria, at Berlin, and in Silesia, the Rhine province, and Alsace-Lorraine. Cement is made in large quantities in Pomerania. Nuremberg, Hanau, Berlin, and Pforzheim are seats of the gold and silver industries. Chemical manufactures flourish in the Bavarian Palatinate, the province of Saxony, Hesse-Nassau, the Rhine province, and Würtemberg. Sugar is manufactured in Brunswick, Anhalt, and Bavaria. Brewing prevails in all parts of the empire, but is a special industry

railway which radiate from Berlin to the E. and W. frontiers, to the N. seaports, and to the Rhine and Bavaria. Germany possesses other main lines of first importance, such as (in part or in whole) the Paris-Strassburg-Vienna line, the Cologne-Mainz-Stuttgart-Vienna line, the Metz-Strassburg-Basel line, the Frankfurt-Munich, Hamburg-Bremen-Essen, and Hamburg-Hanover lines, and the lines which run N. and S. along both banks of the Rhine. Germany is splendidly equipped with internal water-ways. The following are all recent engineering works of great importance:—The Kaiser-Wilhelm (North Sea-Bal-

and a part of the Saar. Altogether, the internal navigable water-ways of the German empire reach a total of 8,800 m.

Commerce.—German thoroughness, scientific organization, and mastery of detail have within the last decade advanced the empire to the third place among the trading nations of the world. In 1905 the exports reached a total of £265,771,850, and the imports £343,213,750, or altogether £608,985,600. The countries with which Germany carries on the largest trade are Great Britain and her colonies, the United States, Russia, and Austria-Hungary. Great Britain



of Bavaria, as distilling is of the N. and N.E. provinces of Prussia. In 1903-4 the consumption of beer averaged 27 gallons per head per annum in the empire, and 62 gallons in Bavaria. Shipbuilding has developed and shown remarkable progress at Stettin, Elbing, Bremen, Hamburg, Kiel, and other seaports. The chief fishing ports are Geestemünde, Bremerhaven, Emden, Vegesack, Altona, and Hamburg.

Communications.—Most of the German railways belong to the imperial or to the state governments. In 1904 there were 34,309 miles open for traffic; of these, only 2,500 miles were privately owned. In addition to the trunk lines of

the Canal (61½ m. long), connecting the North Sea and the Baltic, constructed in 1837-95; the Dortmund-Ems Canal (161½ m.), connecting the lower Ems with the Rhinish Westphalian coal field, in 1892-9; the Elbe-Trave Canal, from Lübeck to the Elbe (42 m.), opened in 1900; the Königsberg-Pillau Canal (24 m.), cut through the Kurisches Haff in 1893-1901; and the Kaiserfahrt Channel, between the Stettiner Haff and the open Baltic, in 1901. Other great canals are projected—(1) to connect Stettin with Berlin; (2) to connect the Dortmund-Ems Canal with Hanover and Magdeburg (i.e. the Elbe); (3) to improve and straighten the Moselle

takes about 20½ per cent. of the total exports, chiefly sugar, woollens, wooden wares, cottons, silk, leather goods, books and prints, paper, toys; and supplies 11½ per cent. of the imports, chiefly cotton and woollen yarn, machinery, coal, raw gold, and iron. The trade with British India, of which 78 per cent. is imports, amounted in 1904 to £21,200,000, and with Australia to over £10,000,000, of which 67 per cent. is imports. The United States takes 8½ per cent. of Germany's exports, and supplies 18½ per cent. of her imports. Of the aggregate trade more than one-third goes through Hamburg. The other large commercial ports are

Bremen, Stettin, Danzig, Lübeck, Kiel, Königsberg, and Memel.

Mercantile Marine.—Here, again, the Germans showed remarkable energy, enterprise, and progress in the last decade of the 19th century. Not only do they rank third (in tonnage) among the sea-carrying countries of the world, but Hamburg and Bremen possess some of the best equipped ocean-going steamers afloat, and the Hamburg-America Steam Packet Company, belonging to the former port, and the North German Lloyd, belonging to the latter, rank among the first shipping associations in the world. In 1905 the merchant fleets of all ports numbered 4,224 vessels of 2,352,575 tons net, of which 1,657, of 1,774,072 tons net, were steamships; the corresponding figures for 1895 were 4,237 vessels of 1,294,288 tons, of which 650, of 413,943 tons, were steamships.

Constitution and Legislature.—The supreme head of the empire is the German emperor. He is assisted by the Federal Council of fifty-eight members, appointed by the several state governments. This body, together with the Diet of the realm (Reichstag), consisting of 397 members elected for five years by universal suffrage, constitutes the legislative power. There are seven ministers of state, each of whom acts independently, under the supervision of the chancellor of the empire. The Federal Council acts, through standing committees, as the supreme administrative and consultative board of the empire. The Imperial Tribunal (at Leipzig) acts as a court of final appeal, and as a court of first and last instance in charges of high treason. Each state contributes a fixed quota to the imperial treasury, but it receives back an approximately equivalent sum from the excise and customs revenues.

Army and Navy.—Military or naval service is legally compulsory upon every man between the ages of seventeen and twenty-seven. Conscripts serve (since 1893) two years with the colours (three years in the cavalry and field horse artillery) and four in the reserve, and after that are enrolled in the Landwehr (or defensive militia) for twelve years. But men may volunteer to serve one year at their own expense. In addition to this there is the Landsturm, to be called out when the country suffers invasion, and including all other able men between the ages of seventeen and forty-five. For the period 1899-1904 the peace strength of the German army was fixed at 495,500 men. In 1904 a bill providing for the gradual increase of the army, till in 1909 it reaches 505,839, was passed. It is esti-

mated that in time of war 3,000,000 men could be put in the field. In 1898 and 1900 the legislature sanctioned a very material increase in the strength of the imperial navy, involving an expenditure of considerably over £50,000,000, so that by the time this money is expended the fleet will consist of 34 battleships, 11 large and 34 small cruisers, with, as a reserve, 4 battleships, and 3 large and 4 small cruisers. In 1905 the number of the crews and their officers was about 33,500. Kiel is the naval headquarters and base on the Baltic, and Wilhelmshaven on the North Sea.

Religion.—According to the census of 1900, the population included 35,231,104 Evangelical (Reformed and Calvinistic) Protestants, 20,327,913 Roman Catholics, and 586,948 Jews. The Roman Catholics predominate in Posen, Silesia, Bavaria, Baden, Alsace-Lorraine, the Rhine province, and parts of Westphalia and W. Prussia. They are distributed between five archbishoprics (Cologne, Gnesen-Posen, Munich-Freising, Bamberg, and Freiburg-im-Breisgau) and twenty bishoprics. The Old Catholics have a bishop at Bonn. The Protestants are governed by provincial consistories and by synods.

Education is compulsory for all children between six and fourteen years of age, and Germany is one of the best educated countries in Europe: for instance, of the military and naval recruits called up in 1902 only '04 per cent. were unable to read and write. Higher education is afforded by nine polytechnics or science colleges (to which was granted in 1899 and 1900 the privilege of conferring the degrees of doctor of engineering and doctor of the technical sciences), and by twenty-one universities. In the winter half-year of 1904-5 these universities were attended by 39,646 students. In addition to the above there are a great number of special schools and colleges, seven academies of art, and numerous conservatoria of music, of which the most famous are at Leipzig, Dresden, Stuttgart, Berlin, Cologne, Munich, Würzburg, and Frankfurt-on-Main. Commercial high schools were founded at Aachen and Leipzig in 1898, and one for girls at Cologne in 1900; others are to be opened at Frankfurt-on-Main, Cologne, and Berlin. About 22 millions sterling are spent annually upon education by the German governments.

See F. Ratzel's *Deutschland* (1898), and *Beiträge zur Geographie des mittleren Deutschlands* (1899); J. Kutzén's *Das Deutsche Land* (4th ed. by V. Steinecke, 1900); Penck's *Das*

Deutsche Reich (1887); the series *Forschungen zur Deutschen Landes- und Volkskunde*, ed. by A. Kirchhoff and Lehmann (1885 et seq.); the series *Deutsche Land und Leben im Einzelschilderungen* (1898 et seq.); *Das Deutsche Volkstum*, ed. Hans Meyer and others (1898).

History.—The earliest history of this region is given under GERMANIA; and compare also CHARLEMAGNE. Germany as a separate kingdom dates from the treaty of Verdun in 843. By that treaty the empire of Charles the Great was finally divided, and Germany fell to the share of Ludwig or Lewis, the grandson of the emperor. Both Ludwig and his son, Charles the Fat, had enormous difficulties to contend with. The Northmen poured into Germany at many points, and in 847 they burnt part of Hamburg. The land had fallen into such disorder and confusion that a strong king was necessary, and the nobles elected Henry, Duke of Saxony, as the successor of Conrad, the first elected sovereign (911-918). Henry (919-936) defeated the Hungarians and Slavs, and under his encouragement a great development took place in town life, and trade grew. Otto I., his successor (936-973), was crowned emperor at Rome in 962 by Pope John XII. From this time the connection between Germany and Italy was close. Otto's son, Otto, was in 967 crowned as joint-emperor by Pope John VII. In 973 Otto the Great died, having made Germany the foremost power in Europe, and restored the Holy Roman empire to its position of supremacy over the civilized world. But though his successors endeavoured to continue his imperial policy, it soon became evident that the connection of the Roman empire with the German monarchy was harmful to both. The attempts of the German rulers to establish their power over the southern peninsula brought them into collision with the papacy. The empire was elective, and thus the German kings were unable to establish a hereditary monarchy, and so to make the central power stable. Of this circumstance the German princes took every advantage, and consistently aimed at securing a large amount of independence. Hence it was that Germany became divided among a number of powerful states, of which Brandenburg (Prussia), Bavaria, and Saxony eventually became kingdoms.

Otto II., although a strong and capable ruler (973-983), found the difficulties of his position insurmountable; while the cosmopolitan imperialism of Otto III.

(983-1002) brought him into direct collision with the German princes and the German Church. His successor, Henry II. (1002-24), made no attempt to carry out ambitious plans, but contented himself with governing Germany. Like Otto III., he failed in Italy. Conrad II. (1024-39) was a wise and far-sighted sovereign, who gave the empire prosperity, and established the royal power on a solid basis. He suppressed rebellions in Italy, and in 1027 was solemnly crowned emperor at Rome. Distinguishing between the Italian and German interests of his empire, he not only kept a firm hold in Italy, but never ignored his duties as a German king. In 1032 the kingdom of Arles (Burgundy) was united to the empire. In the reign of his son, Henry III. (1039-56), Hungary, Poland, and Bohemia became fiefs of the empire, peace was to some extent preserved in Germany, and a succession of German popes attested the emperor's influence in Italy. Under Henry III. the destinies of Europe were guided by Germany. With Henry IV. (1056-1106) the decline of the empire began, and was heralded by the struggle between the ecclesiastical and temporal powers. The election of Hildebrand to the papacy as Gregory VII. in 1073 was followed by a series of attempts to advance the claims of the spiritual at the expense of the temporal authority. The papal decree forbidding investiture was followed by the investiture contest, and by the still greater struggle between the papacy and the empire, which shook Europe, and was not concluded for two centuries, despite the fact that in 1077 Henry IV. submitted to the Pope at Canossa. The outbreak of the first crusade in 1075 strengthened the prestige of the papacy, and at the same time relegated the struggle with the emperor into a second place. Henry V. (1106-25) found it advisable to settle the investiture contest by a compromise called the Concordat of Worms (1122). The crusades, the monastic movement, the growth of canon law, all tended to strengthen the church, which in the 12th century stood at the height of its power. Lothair II. (1125-37) did not renew the contest with the papacy. Busy with extending Christianity and German political supremacy over Scandinavia and Slavonic lands, he allied himself with Innocent II., who crowned him at Rome in 1133. His successor, Conrad III. (1138-52), found that the growth of municipal autonomy in northern and central Italy was proving a serious hindrance to the assertion of the imperial authority south of the Alps. To

combat this movement, which often developed revolutionary tendencies, was one of the objects of the Emperor Frederick Barbarossa (1152-90). In his efforts to curb the power of the Lombard cities he became involved in a struggle with the papacy, which occupied the best part of his life. The strength of the Lombard League was seen at the battle of Legnano in 1176, when Frederick's army suffered a signal defeat. In 1177 at Venice the emperor made his peace with Pope Alexander III., and in 1183 he agreed to the treaty of Constance with the Lombard republics. Thenceforward Italy and Germany were practically separated, and the claims of overlordship, which were all that remained to the emperors of their authority over the Italian cities, were of the most nominal character. Frederick was, however, more successful in breaking the power of his powerful vassal Henry the Lion, whose possessions in Saxony and Bavaria had roused the jealousy of the other princes. Frederick's romantic death in Cilicia, while taking part in the third crusade, was followed by the accession of Henry VI. (1190-7), who married Constance, the heiress of Sicily, and aimed at founding a universal empire. But his brilliant schemes were cut short by his early death, and from that event until 1214 the empire was weakened by the rivalry of Otto IV. (1209-14), the son of Henry the Lion, and Frederick II., the son of Henry VI. The great Pope Innocent III., soon after Otto's coronation in 1209, took up Frederick's cause, and excommunicated the emperor, who, defeated at Bouvines in 1214 by Philip Augustus, retired into private life, and died in 1218. Frederick II. (1212-50) had been crowned in 1212, and after Bouvines became undisputed emperor. With his reign the world-wide contest between the empire and the papacy came to an end. By his death the hopes of the house of Hohenstaufen were shattered. With Frederick II., indeed, expired all possibility of the Roman empire establishing a claim to the government of Christendom. Frederick personally was a man of the most brilliant gifts, a poet, a linguist, and a man of science; but he was no statesman. In order to triumph over the papacy, he devoted all his efforts to building up a despotism in Naples and Sicily. To accomplish this object, he neglected his duties in Germany, and recognized the territorial supremacy of the great nobles, whether laymen or churchmen, thus renouncing the traditional policy of the early Hohenstaufens. The towns, too, grew

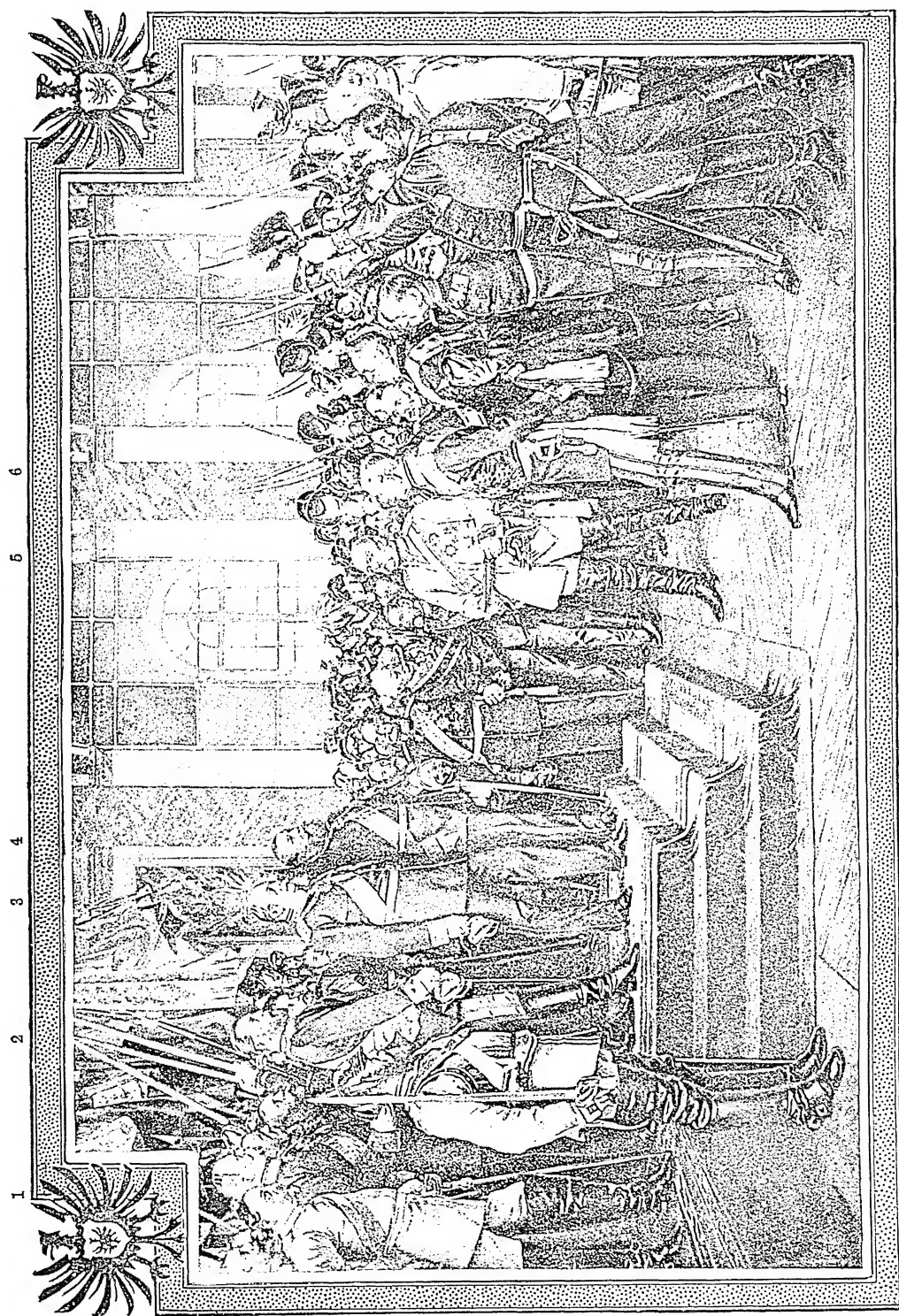
steadily, and for the most part succeeded in securing their independence of the neighbouring lords. Conrad IV. (1250-4), the son of Frederick II., was the last Hohenstaufen king in Germany, and his death in 1254 was followed by the 'great interregnum,' which lasted till 1273.

A new period in the history of Germany may be said to have begun with the election of Rudolf of Hapsburg to the imperial dignity in 1273. By that time disunion had made considerable progress—the central power had declined. Of the various principalities which sprung up, those ruled by the families of Ascania, Welf, Wittelsbach, and Wettin were the most important. The house of Ascania held the mark of Brandenburg and the duchy of Saxony; that of Welf the duchy of Brunswick; while the Wittelsbachs ruled in Upper and Lower Bavaria, and in the Palatinate; and the house of Wettin in Meissen and Thuringia. Besides these powerful princes, Ottocar II., who became king of Bohemia in 1253, had added to his dominions Austria, Styria, Carinthia, and Carniola; while at the same time the houses of Luxemburg, Hapsburg, and Hohenzollern were also growing up, all three destined to play a leading part in the subsequent history of Germany. The emperor had also to reckon with the great ecclesiastics, of whom the most powerful were the archbishops of Mainz, Köln, and Trier. Another obstacle to the establishment of a strong monarchical government was the steady development of the German cities. In the south, towns like Augsburg, Ulm, Ratisbon, and Nuremberg, in the north the Hanseatic league of cities connected with the Baltic trade, all agreed in resisting any encroachments on the part of the central power. Rudolf of Hapsburg left Italy to the Pope and to the house of Anjou. The powerful Ottocar of Bohemia was defeated in 1276, in the battle of Marchfeld, and the establishment of the Hapsburg dynasty in Austria was the result. Rudolf's successor, Adolf of Nassau (1292-8), was deposed by the electors, and slain in battle—the victim of the opposition of the great princes to a strong central government. Albert of Austria, the son of Rudolf, reigned ten years (1298-1308), and Henry of Luxemburg only five (1308-13). Their reigns merely illustrate the disastrous results to the empire of the absence of hereditary succession. For a time the Bavarian and Luxemburg houses took a leading part in German affairs, and Ludwig IV. of Bavaria, having triumphed in 1322

at Mühldorf over his rival for the imperial dignity, Frederick the son of Albert, reigned uneasily till 1346, when he was succeeded by Charles IV., the son of John of Bohemia who fell at Crécy. During the reign of Ludwig a national feeling against the papacy, then established at Avignon, had manifested itself in a very unmistakable manner, and in 1338, at a meeting at Rhense, near Koblenz, the electors had declared the German monarch independent of the Pope. The reign of Charles IV. (1346-78) is most important in the constitutional history of Germany. By the Golden Bull (1356) he made a noteworthy effort to check the growing disruption of political power. By that instrument he settled all matters connected with the imperial election. The electors were to be seven, three ecclesiastical—the archbishops of Mainz, Cologne, and Trier (Treves)—and four lay—the king of Bohemia, the Count Palatine of the Rhine, the Duke of Saxony, and the Margrave of Brandenburg. The election of the emperor was to take place at Frankfurt-on-Main, and the coronation at Aachen (Aix-la-Chapelle). No papal interference was recognized, and the growing independence of the German towns was checked. The Golden Bull remained a fundamental law of the Holy Roman empire till its dissolution in 1806. Wenzel or Wenceslaus, Charles's son and successor, was deposed in 1400, and Rupert, the Elector Palatine, ruled Germany till his death, in 1410. His successor, Sigismund, the brother of Wenzel, took a leading part at the Council of Constance in putting an end to the great papal schism, and in securing the election of Pope Martin V. He then, with difficulty, put down the Hussite rebellion in Bohemia, and was influential in promoting the councils of Basel and Ferrara or Florence. Albert II. of Austria, who succeeded him, only reigned one year; and on his death Frederick III., Duke of Styria and Carinthia, and a member of the house of Hapsburg, became emperor (1440), and reigned till 1493. During this period Germany was subject to attacks from the Turks, to civil war, and all the evils of incompetent government; but the empire was enlarged by the marriage of Frederick's son Maximilian to Mary of Burgundy, heiress of Charles the Bold, and by the acquisition of Tyrol and Alsace, and other territories on the west. The reign of Maximilian I. (1493-1519) witnessed a series of attempts to reform the imperial constitution. The Diet which managed the legislative

affairs of the empire was composed of three chambers—that of the electors, that of the princes (lay and spiritual), and that of the imperial cities. The knightly order—a large body which included the lesser nobility—had no voice in the Diet. Now the rivalries between these three chambers prevented any effectual legislation, and at the same time the relations between the Diet and the emperor were usually strained. Since 1486 the imperial chamber had endeavoured to dispense justice throughout the empire, but with little success. Already in Frederick III.'s reign a party of constitutional reform had arisen, and in 1495, at the Diet of Worms, this party made its voice heard. But while the electors and greater princes were aiming at the establishment of an aristocratic federation, Maximilian wished not only to maintain his own authority, but also to make the empire hereditary in his family. His want of money, however, led him to agree to the reorganization of the imperial chamber, to the annual meeting of the Diet, and to the establishment of the council of regency—a standing council of the empire. Maximilian had indeed no intention of supporting this council, which accordingly soon collapsed; but, taking advantage of the jealousy which many of the princes and imperial knights felt against his electors, he strengthened his position at home, while abroad his reputation during the early years of the sixteenth century stood high. The movement for reform still continued, and in 1512 the empire was divided, for administrative, financial, and military purposes, into ten circles, but the organization did not come into effective operation until 1521. The election of Charles of Spain as the Emperor Charles V. established the rule of the Hapsburgs over Germany, the Netherlands, Spain, Naples, and a large part of the New World. But in spite of his possessions, Charles V. (1519-56), as emperor, was possessed of little real power. Protestantism divided Germany, and checked all the emperor's efforts to establish his authority over a minority of the princes, backed up by the majority of the German nation. The triumph of the Protestants was undoubtedly due in part to the wars which Charles waged with Francis I. and Henry II. of France, in part to the frequent invasions of Hungary by the Ottoman sultan, Solyman the Magnificent. In the end the reformers grew so strong that in 1552 Charles was compelled to agree to the Convention of Passau, by which it was arranged that a Diet

should be called to pacify Germany. In 1553 the Diet met at Augsburg, and a settlement was arrived at which lasted till the outbreak of the Thirty Years' war. The counter-reformation movement, however, set in, the Jesuits being its guiding spirits. Ferdinand I. (1556-64) and Maximilian II. (1564-76) both attempted a policy of conciliation towards the Protestants. But the decrees of the Council of Trent (1564) made reconciliation impossible. With the reign of Rudolf II. (1576-1612) the dreaded crisis drew nearer. A bigoted Roman Catholic, Rudolf was, at the same time, a man of weak will. While the power of the Jesuits grew, Germany suffered from lack of governance, and in 1606 the archdukes of the Hapsburg family met to consider the situation. Matthias, the emperor's brother, was recognized as the head of the house, and Rudolf was forced to resign to him all his dominions except Bohemia. The occupation of Donauwörth by the Roman Catholic Maximilian of Bavaria, and the attempted seizure by the Roman Catholics of Jülich and Cleves, brought Germany to the verge of civil war, which was only averted by the death of Henry IV. of France and by the disturbances in Bohemia. But on the death of Matthias, who was emperor from 1612 to 1617, Ferdinand II. became emperor, and in the following year the Thirty Years' war began. During that war Germany suffered unspeakable ills. Till 1630 the imperial armies carried well-nigh all before them. Tilly and Wallenstein proved irresistible. Frederick, Count Palatine and son-in-law of James I. of England, was driven from his dominions, and Christian IV. of Denmark was conquered. Stralsund did indeed hold out (1628) with success against Wallenstein, but nearly all Germany submitted to the emperor. It was not till the landing in 1630 of Gustavus Adolphus of Sweden in Germany that the tide turned. The defeat of Breitenfeld in 1631 and of Lützen in 1632 were most disastrous to the hopes of Ferdinand, and the murder of Wallenstein in 1634 deprived him of his ablest general. In 1635 France entered into the war, and Ferdinand III. (1637-57) was glad to conclude the treaty of Westphalia (1648) with France and Sweden. The counter-reformation had spent its force, and both Roman Catholics and Protestants were ready to accept a compromise. The imperial power was forced to recognize the practical independence of the German princes. The Diet and the imperial chamber still continued



Proclamation of the German Emperor at Versailles, Jan. 18, 1871. By Anton von Werner.
 1. Duke Ernest of Saxe-Coburg Gotha. 2. Crown Prince, afterwards Frederick II. 3. William I. 4. Grand Duke of Baden. 5. Bismarck. 6. Motke.
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to meet, but they had little or no power. Germany had been devastated, and for many years the country lay in 'the insensibility of exhaustion.' By the peace of Westphalia, too, the empire experienced severe territorial losses. Sweden obtained the greater part of Pomerania and the bishoprics of Bremen and Verden as fiefs of the empire, while France secured legal possession of Metz, Toul, and Verdun, which had been conquered by Henry II., as well as of Breisach and Alsace. During the long reign of Leopold (1658-1705) Germany slowly recovered consciousness. The attacks of Louis XIV. and the inroads of the Turks exhausted Leopold's already crippled resources. But the ambition and aggressions of Louis XIV., as illustrated by the seizure of Franche-Comté (1674) and of Strassburg (1681), by the devastations of the Palatinate, and by the revocation of the Edict of Nantes (1685), slowly but surely threw the German princes on the side of the emperor. During the war of the League of Augsburg (1688-97) and the Spanish Succession war (1702-13) public opinion in Germany was steadily opposed to France. In alliance with England, Germany successfully contended against the attempts of Louis XIV. to dominate Europe. Joseph I. (1705-11) and Charles VI. (1711-40) both owed much to English assistance, and in 1714 the peace of Baden between the empire and France, following on the peace of Utrecht, closed a long series of struggles which had begun in the days of Francis I. and Charles V.

During the 18th century the rapid development of Prussia tended still further to weaken Germany as a unit in European politics. While Frederick William I. had, by 1721, practically driven the Swedes from the north of Germany, Frederick the Great, by the seizure of Silesia (1740-5), enormously strengthened the position of Prussia. The efforts of Maria Theresa and Joseph II. to secure compensation failed, owing to the tenacity of Frederick the Great. The Seven Years' war (1756-63) had enabled him to place himself on an equality with Austria. But the outbreak of the French revolution undid the work of generations, at least for a time. Napoleon's secularization of the ecclesiastical states, overthrow of Austria at Austerlitz (1805) and of Prussia at Jena and Auerstädt (1806), and formation of the Confederation of the Rhine, completed the extinction of the Holy Roman empire. In 1806, when the new kings of Bavaria and Württemberg, the electors of Baden, the landgrave of Hesse, and other princes acknowledged the French

emperor as their protector, and separated themselves from the empire, Francis of Austria took the title of Emperor of Austria. After the fall of Napoleon the princes of Germany agreed to unite in a confederation. A permanent diet of plenipotentiaries from these states met at Frankfort-on-Main, under the presidency of Austria. In each state a constitutional government was to be set up. This settlement proved neither permanent nor satisfactory. Though constitutions were granted to many of the small states, Austria, no less than Prussia, was opposed to popular representation. Very little real change was made in the government of any German state, and consequently the people became very dissatisfied. Moreover, a strong desire for unity grew up; but the popular risings in several of the smaller states in 1830, the result of the French revolution of that year, led in some instances to the grant of a constitution, in others to the use of repressive measures. Between 1830 and 1848 the desire for the unity of Germany was encouraged by the formation (1834) of a customs union (*Zollverein*), which, headed by Prussia, removed many useless restrictions from commerce. Influenced by the third French revolution, which broke out in 1848, popular movements were started in many states, the rulers of which were forced to adopt a liberal policy. The revolutions were most serious in Austria and Prussia, and eventually it was arranged that a national assembly should be elected by the German people. This met on May 18, 1848, at Frankfort, but came to an end in June 1849, and thus closed a premature attempt to give Germany a real unity. During 1849 and 1850 Prussia and Austria each made independent attempts to unite Germany. While Prussia formed what was called the German Union, Austria endeavoured to reconstitute the confederation. Eventually Prussia consented to the restoration of the constitution of 1815, and from September 1850 the Diet resumed its sittings at Frankfort.

The joint attack of Prussia and Austria upon Denmark in 1863 and 1864 only increased the mutual hostility of the courts of Vienna and Berlin, and in 1865 Bismarck determined to bring to an issue the question of the headship of Germany. The victory of Prussia over Austria in 1866 decided the rivalry in her favour. As soon as peace was made all the states north of the Main formed a North German confederation under the leadership of Prussia, and the first meeting of

the Diet took place at Berlin on Feb. 24, 1867. On the outbreak of the Franco-German war in 1870 the South German states remained true to Prussia, and during the war decided to unite with the North German confederation. That body was, after the adhesion of the south Germans, changed into the German Confederation, and on Jan. 18, 1871, at Versailles, William, king of Prussia, was proclaimed German emperor.

Before the new empire had time to get well shaken together, it was confronted by a conflict and a menace. The pretensions of the Ultramontane party in the Roman Catholic Church seemed incompatible with the full supremacy of imperial power, and the alarming and vigorous growth of social democracy amongst the working classes was regarded as dangerous to the established order, political and social. But in spite of energetic efforts at repression by the imperial authorities, both these parties triumphed. The Roman Catholic Centre, after a long struggle known as the *Kulturkampf*, forced Bismarck to a compromise (1880). The Social Democrats have increased year by year both in numbers and in power, gaining fresh accessions of strength from the very forces which have co-operated to the remarkable development of the country. Among these forces is the colonial ambition, to which Bismarck finally gave practical expression in 1883-5, but which has resulted, not in providing an outlet, as was hoped, for the surplus energy and population of the nation, and new markets for their manufactured wares, but in saddling Germany with almost useless, and certainly very expensive, luxuries. For from about 1880 the newly awakened national energy had begun to find vent, in a wonderfully successful way, in the fields of industrial and commercial expansion. But the evils which inevitably attend upon a quickening of the competitive spirit created in Germany also copious sources of discontent, from which social democracy has been constantly fed. Moreover, the growth of autocracy and the reconsolidation of the power of the privileged classes, which have ensued since the accession of William II. (1888), a man of imperial outlook as of imperious will, have also stiffened and augmented the elements of opposition which crystallize around social democracy. For under his influence Germany has been pushed to the very forefront on the arena of the world's politics, though at the cost of increased burdens laid upon the people, constrained to find means for the building of a

formidable navy, and to support a more strenuous protectionist policy in the interest of the agrarian (land-owning) classes. See *Deutsche Geschichte*, by Dahn, Dove, and others (1883, etc.); Lamprecht's *Deutsche Geschichte* (1891, etc.); Janssen's *Geschichte des Deutschen Volkes seit dem Ausgang des Mittelalters* (Eng. trans. 1903); Pütter's *Historical Development of the Constitution of the Germanic Empire* (Eng. trans. 1790); Bryce's *The Holy Roman Empire* (new ed. 1904); Von Raumer's *Geschichte der Hohenstaufen* (1872-3); Giesebrecht's *Geschichte der Deutschen Kaiserzeit* (1881, etc.); Ranke's *Hist. of the Latin and Teutonic Nations, 1494-1514* (1887) and *Hist. of the Reformation in Germany* (1845-7); Gardiner's *The Thirty Years' War* (1874); Erdmannsdörffer's *Deutsche Geschichte 1648-1740* (1892, etc.); Schäfer's *Siebenjähriger Krieg* (1867-74); Heigel's *Deutsche Geschichte seit 1786* (1899, etc.); Von Sybel's *Die Begründung des Deutschen Reichs* (1889-90); Von Treitschke's *Deutsche Geschichte im 19ten Jahrhundert* (1879-94); Headlam's *Bismarck* (1899); Bismarck's *Memoirs* (1898).

Language and Literature.—German is a branch of the Teutonic division of the Aryan family of speech. Its development followed, from the 7th century onwards, along two main lines—High German (Hoch-Deutsch), which is now the official language; and Low German (Platt-Deutsch), which is spoken principally in Schleswig-Holstein, Mecklenburg, Pomerania, Hanover, and Westphalia. Both have attained the dignity of literary tongues. High German has gone through three stages of development, known as Old, Middle, and New respectively. During the first two stages books were generally written in great part in one or other of the local dialects. The language of the third stage is due to a fusion of dialects, and grew out of the style and diction adopted in the administrative chancelleries of the German states, and owed its widespread acceptance to the fact of Luther choosing it as the speech into which to translate the Bible. In other words, modern classical German was in its origin a book language. Some of the old dialects, however, still survive, and even possess literatures of some distinction, as, for instance, the Alemann, used, amongst others, by Hebel; Bavarian, which has been used by Anzengruber and Rosegger; and the Upper Saxon (including Meissener and Silesian), which has been used by Gryphius and Holtei.

The history of German litera-

ture begins with the 10th century, its typical forms being (1) vernacular songs of the old heathen gods and heroes, and (2) monastic poems of a religious character, mostly composed in Latin. Of the latter, the plays, written about the end of the 10th century by Hroswitha, a nun of Gandersheim, deserve special mention. The *Heliand*, a 'harmony' of the gospels, in the old Saxon dialect, and in the alliterative style of the heathen heroic songs, as well as Otfried's *Evangelienharmonie*, and one or two other works, were attempts to combine the chief characteristics of the two schools. Out of the powerful influences of the crusades and the splendid court life of the Hohenstaufen emperors arose the golden age of the *Minnesänger*. Men of knightly rank and polite breeding travelled from castle to castle and court to court, making and singing their songs of love (*minne*) and poetic tales of heroic deeds. The most famous of these men were Heinrich von Veldeke (*Enide*), Hartmann von der Aue (*Der arme Heinrich, Iwein*), Gottfried von Strassburg (*Tristan und Isolde*), Wolfram von Eschenbach (*Parzival und Titurel*), and Walther von der Vogelweide, who won especial renown as a song-writer. To this same period (12th and 13th centuries) belong *Das Nibelungenlied* and *Gudrun*, which weave together for the popular taste the heroic tales of the distant Germanic past. In respect of the greatness of their conceptions, their powerful character-drawing, their tragic action, their heathen spirit, these great epics were a marked contrast to the mystical, religious, and chivalrous tendencies of the *Minnesänger*. From the beginning of the 14th century the traditions of this courtly school began to be adopted by men of burgher extraction. They made a trade of verse-making, and formed themselves into verse-makers' guilds (*Meistersänger*) in Nuremberg, Augsburg, Ulm, etc. Thus German poetry became eventually enslaved to rigid rules, and was made didactic. These same burgher verse-makers also turned their attention to dramatization, and vulgarized the mystery plays, passion plays, and similar narratives in spectacular form, which were especially popular in the 13th and 14th centuries. The best, freshest, and most famous productions of this class, though rather later in date, are the *Fastnachtspiele* and *Schwänke* of Hans Sachs (1494-1576), the cobbler poet of Nuremberg. At the same time prose began to be used as a vehicle of expression in the so-called *Volksbücher*—e.g. *Die schöne Melusine*, *Die*

Haimonskinder, *Tyl Eulenspiegel*, *Doktor Faust*, *Die Schildbürger*—in the animal satire of *Reineke Fuchs*, and, though in a very different style, in the writings of the religious mystics—Meister Eckart, Suso, Tauler, Merswin—as well as in certain town chronicles. In other words, the productions which enjoyed most favour in the 14th, 15th, and 16th centuries were those that appealed directly to the 'man in the street' of that time. But about the beginning of the last-named century two new currents of thought burst into the field, and carried everything before them—the humanistic movement from across the Alps, and the religious reformation initiated from within. The former, however, after producing one notable author in Ulrich von Hutten (1488-1523), who wrote in both Latin and German, was completely swamped by the latter. Luther's campaign against the Church of Rome was preceded in the field of literature by sundry satirical attacks of a more or less general character, as in the *Narrenschiff* of Sebastian Brant (1457-1521), the *Sermons* of Geiler von Kaisersberg (1445-1510), the *Narrenbeschwörung* and *Schelmensunft* of Murner (1475-1537). Luther's translation of the Bible marks, as already stated, the effective beginning of modern German literature. Luther also wrote notable hymns, as well as sermons, letters, *Tischreden*, etc., all in the vernacular. Hans Sachs, too, was a sworn champion of the reformation, and publicly hailed Luther as the 'Wittenberg Nightingale.' Next to these two, the men who figured most prominently between the reformation and the outbreak of the Thirty Years' war were Sebastian Franck (c. 1500-42) and the satirist Fischart (fl. 1550-90). Then followed what was, from the literary point of view, the arid desert of the 17th century. During the barbarous period of the Thirty Years' war and the years of utter exhaustion which followed it not only were the writers few, but they hardly ever rose above a dull mediocrity. The most influential author of this epoch was Martin Opitz (1597-1639), nicknamed the 'Swan of Bober,' founder of the 'first Silesian school' of poetry—i.e. verses carefully dressed up, according to rule, to instruct the understanding. The affectations of the time, especially its servile imitation of foreign diction and foreign literary models, were satirized in the comedies of Gryphius (1616-64), the *Sinngedichte* of Logau (1605-55), and the *Scherzgedichte* of Lauremberg (1590-1658). These men, along with Hoffmannswal-

dau (1617-79), a writer of rather frothy love songs, and the genuine poet Paul Fleming (1609-40), constituted the 'second Silesian school,' the bond of connection being, however, geographical rather than literary. Moscherosch (1601-69), Grimmelshausen (1625-76), and Abraham a Santa Clara (1644-1709) in different ways imitated Spanish prose models. Here must be mentioned Jakob Böhme (1575-1624), the mystic. Paul Gerhardt (1607-76) and Angelus Silesius—properly Johann Scheffler—(1624-77) both wrote acceptable hymns. Somewhat later, and on the more serious field of philosophy, we have the well-accredited names of Leibniz (1646-1716), one of the ablest and most enlightened spirits of his age; the philosophers Wolf (1679-1754) and Thomasius (1655-1728); and the Pietists Spener (1635-1705) and Francke (1663-1727). A new impulse was given to German literature by the dry and uninspired Leipzig professor Gottsched (1700-66), who set up to be a dictator of taste in *belles-lettres*, his standard being a 'Germanized' version of the pseudo-classicism of Boileau and Racine. At the same time another school of very different tendencies, and deriving its chief impulses from English literary models and the earlier golden age of German literature, arose in Switzerland, its leading spirits being Bodmer (1698-1783) and Breitinger (1701-76). For some fifteen years these men waged unceasing warfare against Gottsched's vapid theories, in which they were ably assisted by the witty satires of Liscow (1701-60). English influence is also discernible in the didactic poems (e.g. *Die Alpen*) of the great Swiss scholar Von Haller (1705-77), and in the more elegant fables, epistles, and poetic tales of Hagedorn (1708-54). Some of Gottsched's most talented disciples, revolting against his dictatorship, endeavoured to infuse some breath of life into his models in a collective work known as *Die Bremer Beiträge*. The chief spirits of this company were Rabener (1714-71), and Gellert (1715-69), whose *Fables and Moral Tales* enjoyed an immense popularity. However, despite these men, despite Bodmer and Breitinger, despite the dilettante poetry of Uz (1720-96) and 'Father' Gleim (1719-1803), and the readable descriptive poems of Ewald von Kleist (1715-59), the Franco-classical standards still continued to dominate German literature until the publication, at intervals between 1748 and 1773, of Klopstock's *Messias*. This work, a sacred epic suggested by Milton's *Paradise Lost*, although tinctured with hollow rhetoric and the tear-

ful sentimentality of the age, was the first outcome of real genius and originality which had appeared since the days of Luther and Hans Sachs. No less by the strength and copiousness of its language than by the sublimity of its subject, its religious earnestness, and its true poetic inspiration, it acted like a revelation, and practically marks the beginning of the later golden age of German literature. Klopstock (1724-1803) also wrote odes, sacred songs, and numerous other works. His stimulus awakened another genius in Wieland (1733-1813), whose strength lay, however, in the composition of romances (e.g. *Agathon*, *Musarion*, *Oberon*, *Geschichte der Abderiten*, *Aristipp*), in which ease and grace of style were paired with a playful fancy and a strongly epicurean view of life. Wieland was also a prolific translator (e.g. of Shakespeare), and founded the first German literary periodical, *Die Deutsche Merkur*. Of his minor contemporaries it will suffice to mention Musæus (1735-87), author of popular *Märchen*; Knigge (1752-96), whose *Umgang mit Menschen* enjoyed an extraordinary vogue; Lavater (1741-1801), the author of *Physiognomische Fragmente*, whose oracular style and seerlike pretensions were caustically ridiculed by Lichtenberg (1742-99), also known for a striking commentary on Hogarth's plates; Hippel (1741-96), who wrote humorous and satirical romances (*Die Lebensläufe*); and Gessner (1730-88), a Swiss, author of famous, though tame and colourless, *Idylls*.

Truer views with regard to art and literature, especially in the domain of poetry and the drama, were convincingly taught (in *Hamburgische Dramaturgie* and *Laokoon*), and illustrated by plays fashioned on the best English models (*Minna von Barnhelm*—the first real comedy in German—*Emilia Galotti*, *Nathan der Weise*), by a man of rare attainments and a sterling love of truth, Lessing (1729-81); and the true value of the ancient Greek love of beauty was, with equal convincingness, set forth by Winckelmann (1717-68). When Rousseau trumpeted abroad his gospel of 'Back to Nature!' there were none who welcomed it with greater enthusiasm than the Germans, their spirit famished by the dry ashes of the *Aufklärung* (enlightenment), which Frederick the Great and his age had crammed down their throats. And the ardour of their revolt was intensified tenfold by the intoxicating licence of the French revolution, so that in their insurrection against the tyranny of the understanding and the frigidity

of its ideals, as well as against the dragooning of thought, life, and habit, they burst all barriers of restraint, and in many cases gave vent to the ferment and torrential impetuosity of their spirits in every kind of literary experiment, extravagance, and excess. This period is known as the *Sturm und Drang* (tempest and passionate ardour). One of its earliest, as also sanest, exponents was Herder (1744-1803), a man of wide knowledge and equally wide sympathy, a strenuous advocate of tolerance and humanity, as Lessing was before him, who sought for the fountains of wisdom in the earliest, simplest, and freshest forms of poetry—the poetry, namely, of primitive peoples and of the unlearned (*Volkslieder*). His *Kritische Wälder*, *Stimmen der Völker in Liedern*, and other books, are typical of his work in this direction: while the fruits of his ripper years, *Vom Geiste der Hebräischen Poesie*, *Palmblätter*, and his *magnum opus*, the crowning-stone of his thinking, *Ideen zur Philosophie der Geschichte der Menschheit*, are animated by well-considered and noble aims of life. The temper of the *Sturm und Drang* revolt also found expression, though in very different ways, in the hot exuberance of Klinger's (1752-1831) plays (e.g. *Sturm und Drang*) and romances; in the effervescence and unlicensed extravagance of the plays (e.g. *Golo und Genoveva*) and idylls of 'Maler' Müller (1750-1825); in the oracular but desultory utterances of Hamann (1730-88), the 'Magus of the North'; in the lyrics of the group known as the Göttinger Hainbund—Voss (1751-1826), Hölty (1748-76), Count Christian (1748-1821) and Count Friedrich Leopold (1750-1819) zu Stolberg, Bürger (1748-94), and the dramatists Leisewitz (1752-1806) and Lenz (1750-92), especially the *Julius von Tarent* of the former; in the Rousseauesque romances and the more philosophical productions of Jacobi (1743-1819); in the popular writings of the *Wandsbecker Bohe*..., Matthias Claudius (1740-1815); in the semi-mystical romances (*Morgenthau* and *Fahrendorn*) of Jung Stilling (1740-1817), who also left a charming autobiography; and even in the works of the sane and patriotic Justus Möser (1720-94). And along with these must be classed the youthful effusions of Goethe (*Götz und Werther*) and Schiller (*Räuber*, *Fiesco*, *Don Carlos*), the works by which they won their reputations, as well as the deep poetic romances (*Hesperus*, *Siebenkäs*, *Titan*, *Fliegjahre*), ponderous and undigested, of Jean Paul Richter (1763-1825),

But the genius of Goethe and of Schiller was too original, and their spirit too great, for them to remain infected by the unhealthy ferments of this revolutionary epoch. In both cases ferment led to clarification, and subsequent development of a high poetic character, for nine years (1796-1805), in the harmonious interaction of a friendship of the closest kind. Goethe (1749-1832) steadily cultivated the impulses and dictates of his nature, until, in his own perfected and harmonious individuality, he combined the limpidity and natural simplicity of the ancient Greek with the warm but chastened enthusiasm of a son of the revolution, and in his varied writings displayed a breadth and comprehensiveness of outlook, a ripeness of wisdom, and a mastery of subject and of style, which have stamped him as one of the greatest writers of all times. His sovereign power is exhibited in dramatic works differing so widely in scope and treatment as *Egmont*, *Iphigenia*, and *Torquato Tasso*; in the idyll, *Hermann und Dorothea*; the romance of *Wilhelm Meister*; the unique autobiographical *Wahrheit und Dichtung*; a host of lyrics of the very first order; and, lastly, the culminating achievement of his life, the profound philosophical poem of *Faust*. Goethe also made valuable contributions to botany and physics (*Farbenlehre*). Schiller (1759-1805) did not travel so far along the road towards full and harmoniously balanced culture as his friend. For one thing, he did not live so long; but for all that he was a noble and earnest character, aglow with love for freedom, true nobility, goodness, and humanity. His works embrace dramatic poems (*Wallenstein*, *Maria Stuart*, *Jungfrau von Orleans*, *Wilhelm Tell*), lyrics (*Das Lied von der Glocke*), and especially ballads, and discussions on the philosophy of art (*Aesthetische Erziehung des Menschen*), all ranking amongst the best loved productions of German literature. Besides this, he showed in his historical writings (*Geschichte des dreissigjährigen Kriegs*, *Geschichte des Abfalls der Niederlande*) that German prose could be written with grace, as well as made to glow with sustained eloquence, whilst at the same time retaining its native depth of thought. Richter, who is sufficiently known as Jean Paul, is not only the high priest of human friendship, of nature, and of love for the lowly and the despised; he is also the greatest philosophical humorist Germany has produced, his humour ranging from the grimmest scorn to the tenderest irony. In addition to

his longer romances he wrote charming idylls (*Fischlein, Wutz*) of a simpler character, shorter satirico-humorous pieces (*Fülbel*, *Freudel*, *Schmeltzle's Reise*, *Dr. Katzenberger*), treatises on education (*Levana*) and art (*Vorschule der Aesthetik*), and a delightful autobiography. Between 1775 and 1832 Weimar, where Goethe settled in the former year, and where he died in the latter, was the literary capital of Germany. There lived also Wieland, Herder, and Schiller. The great academic philosophers of Germany—Kant, Fichte, Schelling, and Hegel—who were coeval with this golden age, exercised, especially the two first named, a considerable influence upon the minds of their contemporaries, for instance Schiller.

Amongst the minor writers of this epoch it must suffice to enumerate Wilhelm von Humboldt (1767-1835), Alexander von Humboldt (1769-1859)—the former writing on the philosophy of language, the latter on S. America; Hölderlin (1770-1843), the poet; Hebel (1760-1826), author of *Allemännische Gedichte*; Wilhelm Hauff (1802-27), author of *Märchen*, the historical novel *Lichtenstein*, in Scott's manner, two or three short stories, and two or three excellent songs; Zschokke (1771-1848), author of 'shockers' and lighter tales; and the historian Joh. von Müller (1752-1809). The most successful writers of light acting plays were Iffland (1759-1814) and Kotzebue (1761-1819). German literature has always shown a remarkable tendency to develop 'schools' of writers. The great Weimar epoch was followed by the romantic school, which derived its chief impulses from the philosophers already named, and from Goethe and Schiller. The most illustrious exponents of the school were Friedrich von Schlegel (1772-1829) and A. W. von Schlegel (1767-1845), its critics and theoretical founders; Von Hardenberg (1772-1801), better known as Novalis; Tieck (1773-1853), reshaper of the old fairy tales and folk tales, and translator, in collaboration with A. W. von Schlegel, of the standard German edition of Shakespeare; Heinrich von Kleist (1777-1811), who deserves higher recognition than he has yet received both as dramatist (*Kathchen von Heilbronn*, *Der zerbrochene Krug*, *Der Prinz von Homburg*) and as story-teller (*Michael Kohlhaas*); E. T. W. (A.) Hoffmann (1776-1822), a vivid narrator of the grotesque and the horrible, but also of strong, simple short stories (*Meister Martin*, *Johannes Wacht*, *Doge und Dogaresa*); Von Chamisso (1781-1838), in the popular fairy tale *Peter Schlemihl*; De

la Motte-Fouqué (1777-1843), who wrote the graceful *Undine*, and *Der Zauberring*, and other romances of chivalry; Werner (1768-1823), who wrote heavy 'fate' tragedies (e.g. *Kreuz an der Ostsee*); and Arnim (1781-1831) and Brentano (1778-1842), whose talents were in excess of their artistic sense. To the same school belong, though they wrote with generally greater artistic restraint, the poets Eichendorff (1788-1857) and Von Schenkendorff (1783-1817); the patriotic singers Arndt (1769-1860) and Körner (1791-1813); Rückert (1789-1866), who had a special fondness for the Orient; Uhland (1787-1862), whose lyrics and ballads often show the directness and simplicity of true *Volkslieder*; Von Platen (1796-1835), who advocated finish of style; and Wilhelm Müller (1794-1827); also the novelist Immermann (1796-1840), author of *Die Epigonen* and *Münchhausen*. Here should be mentioned the brothers Jakob (1785-1863) and Wilhelm (1786-1859) Grimm, collectors and editors of the world-famous *Volks- und Haus-Märchen* and fosterers of ancient German mythology, language, and literature.

But the most conspicuous figures in the generation which followed the death of Goethe were Heine, Gutzkow, and Fritz Reuter. Heine (1797-1856), although touched with romanticism, and ambitious to be taken for a political magnate, won his greatest fame as a writer of lyrics (*Buch der Lieder*, *Nordseebilder*), in which mockery, pathos, and genuine humour are intermingled in an inimitable perfection of style. He also showed the same original genius, as well as matchless perfection of style, in the prose *Reisebilder*, and in other works, most of which, however, were of an occasional character. Fritz Reuter (1810-74), one of Germany's greatest humorists, excelled as a story-teller (*Ut mine Stromtid*, *Ut de Franzosentid*, *Ut mine Festungstid*), but wrote in Platt-Deutsch, or Low German; and he also published good poetry (*Kein Hüsung*, *Hanne Nüte*, *Läuschen un Riemels*). Gutzkow (1811-78), the most important representative of the 'Young Germany school,' which subordinated literature to politics, distinguished himself as a dramatist (*Zopf und Schwert*, *Uriel Acosta*) and novelist (*Ritter vom Geist*, *Zauberer von Rom*). Other writers who displayed similar tendencies, though in different ways, and often in feud with one another, were Börne (1786-1837), Laube (1806-84), Menzel (1798-1873); the poets—Freiligrath (1810-76); Bodenstedt (1819-92), author of *Lieder des Mirza*

Schaffy; Niernbsch von Strehlenau (1802-50), better known as Lenau, author of the epics *Faust*, *Savonarola*, *Die Abtöten*; Count von Auersperg (1806-76), better known as Anastasius Grün, author of *Spaziergänge eines Wiener Poeten* and *Schutt*; Geibel (1815-84); and Annette von Droste-Hülshoff (1798-1848): the dramatists—Von Bauernfeld (1802-90), a writer of comedies; Grabbe (1801-36); and Hebbel (1813-63), whose plays of *Judith*, *Maria Magdalena*, and *Agnes Bernauer* show considerable originality and genius; and the novelists—Häring (1797-1871), better known as Wilibald Alexis, who wrote stories dealing with Prussian history (*Cabanis*, *Die Hosen des Herrn von Bredow*, etc.); Gotthelf (1797-1834), who, under the pseudonym of Bitzium, published good stories of Swiss life (e.g. *Uli der Knecht*); and Auerbach (1812-82), who set the fashion of writing *Dorfgeschichten*. Here it will be convenient to mention several writers who belonged to no particular school, but whose works exercised more or less influence upon their contemporaries—the philosopher Schopenhauer (1788-1800), a strong, clear writer; the biographer Fr. D. Strauss (1808-74), author of *Leben Jesu*; the philosopher and theologian Schleiermacher (1768-1834); the educationists Herbart (1776-1841) and Froebel (1782-1852); the historians Mommsen (1817-1903), Von Ranke (1795-1886), Von Sybel (1817-95), Von Treitschke (1834-96), and Gregorovius (1821-91); the dramatists Grillparzer (1791-1872), author of *Die Ahnfrau*, *Sappho*, etc.; Otto Ludwig (1813-63), author of the able realistic dramas *Der Erbforster*, *Die Makabäer*, and *Agnes Bernauer*; the Austrian writer of powerful peasant plays, Anzengruber (1830-89), such as *Der Meindlbauer*, *Der Pfarrer von Kirchfeld*, and *Das vierte Gebot*; and Paul Lindau (1839), author of light and lively stage pieces and some novels.

About the middle of the century (19th) there was a revival of the epic or narrative in verse, the most popular pieces in this groove being *Otto der Schütz*, and other works, by Kinkel (1815-82); *Amaranth* and *Das Lied vom neuen Deutschen Reich* of Von Redwitz (1823-91); *Waldmeisters Brautfahrt* of Roquette (1824-96); the *Demurgos* and (modernized) *Nibelunge* of W. Jordan (1819); and, most popular of all, *Der Trompeter von Säckingen* of Von Scheffel (1826-86). Later on the same genre has been successfully cultivated by Hamerling (1836-87) in *Ahasver, König von Zion*, though he also wrote good satirical poems (e.g. *Homunculus*); by Lingg (1820) in *Die*

Völkerwanderung; Julius Wolff (1834) in *Der Rattenfänger von Hameln*, *Der Wilde Jäger*, *Tannhäuser*, *Die Puppenheimer*; Baumbach (1840) in *Zlatarog*, *Lieder eines fahrenden Gesellen*, and *Kaiser Max*; F. W. Weber (1813-94) in *Dreizehnlinden*; Nordhausen (1868) in *Joss Fritz und Vestigia Leonis*; and Heinrich Hart (1855) in *Das Lied der Menschheit*. To this same period belong Klaus Groth (1819-99), who wrote, and wrote well, both poems (*Quickborn*) and stories in Platt-Deutsch, and the poet Count von Schack (1815-94). The most distinguished names amongst the contemporary novelists were the two Swiss, Gottfried Keller (1819-90) and C. F. Meyer (1825-98); and at a later date Freytag (1816-95) and Spielhagen (1829). Keller's chief works, *Der grüne Heinrich* and *Die Leute von Seldwyla*, unite poetic conception with realistic humour. Meyer wrote good historical novels (e.g. *Jürg Jenatsch*, *Der Heilige*, etc.) and an idyllic epic, *Hutlens letzte Tage*. Freytag's field was the social and socio-historical romance (*Soll und Haben*, *Die verlorene Handschuh*, *Die Ahnen*), besides which he wrote good plays (*Die Valentine* and *Die Journalisten*). Spielhagen, too, wrote vigorous social novels—i.e. novels with a purpose; e.g. *Hammer und Amboss*, *In Reih und Glied*, *Sturmflut*, which are eminently readable. Paul Heyse (1830), author of *Kinder der Welt*, *Im Paradiese*, *Himmelsche und Irdische Liebe*, and a host of others, and Theodor Storm (1818-88) in *Immensee*, *Aquis Submersus*, *Der Schimmelreiter*, etc., excelled in the short story; both have written good verse as well. Along with these half-dozen may be named, in a secondary degree, the archaeological novels of Dahn (1834), dealing with the Germanic past; Ebers (1837-98), mostly with ancient Egypt; and Von Scheffel (*Ekkhard*); the historical novels of Hausrath (1837), whose pseudonym is George Taylor; and Fontane (1819-98) in *Effi Briest*, *Stine*, *Irrungen-Wirrungen*, and several other books; the humorous romances (*Der Hungerpastor*, *Abu Telfan*) of Raabe (1831) and Seidel (1842), the latter in, for example, *Leberecht Hühnchen* and *Vorstadtgeschichten*; the kulturgeschichtliche novels of Riehl (1824-97), Franzos (1847-1904), Rosegger (1843), and Hackländer (1816-77), chiefly soldier life; and Wilbrandt (1837). Marie von Ebner-Eschenbach (1830) in *Bozena*, *Zwei Comtessen*, and other books, and Von Saar (1833) in *Novellen*, *Herbstreigen*, and *Camera Obscura*, both Austrians, are alike distinguished for their

light touch and attention to form. During the closing years of the 19th century German literature, in every department, was more or less influenced by the naturalistic writers of France, Russia, Norway, and Sweden, though barely half a dozen have exhibited high gifts of originality or genius. The genre which has been most successfully cultivated has been the naturalistic drama and the naturalistic novel. Here the two names of Sudermann (1857) and Hauptmann (1862) stand out pre-eminent. The former shows his mastery of stage-craft in dramas of modern life (*Die Ehre*, *Heimat*) and other genres (*Johannes*, *Die drei Reihersfedern*), and also writes novels (*Frau Sorge*). But Hauptmann, although he has written realistic plays (*Die Weber*, *Fuhrmann Henschel*), shows considerable poetic originality in the allegorical poem *Die versunkene Glocke*, and the märchen drama of *Hanneles Himmelfahrt*. In the field of the historical drama the most accomplished writer of recent years has been Von Wildenbruch (1847), whose best pieces include *Die Quitzows*, *Generalfeldoberst*, *Heinrich und Heinrichs Geschlecht*; he has also written novels. With him may be mentioned, though at some distance away, Fulda (*Talisman*), Paul Lindau, L'Arronge, Wilbrandt, Voss, Fitger, Halbe, Hartleben, Dreyer, Otto Ernst (i.e. Schmidt), and Schnitzler. Wagner's great music dramas also deserve notice here. F. T. Vischer (1806-86) stands quite apart as a caustic humorist. One of the greatest influences which have affected German literature in quite recent years has been the teaching (e.g. *Also sprach Zarathustra*) of the philosopher Nietzsche (1844-1900), the prophet of intellectual pride and the imperious character. Wilbrandt (already named), Rudolf Lindau, Telmann, Jordan, Hans Hoffmann, and Hopfen are older novelists of some reputation; also Stinde, creator of the humorous *Buchholz* novels. Since ten or a dozen years before the end of the 19th century German literature, apart from works by the men just named, has been very largely in a state of chaos. A deliberate seeking after eccentricity, novelty, and sensation, an aggressive theorizing, a special fondness for sexual problems and social questions, a rude revolt against the older accepted ideals and a craze for everything modern, irrespective of its fitness for literary treatment, and a shifting of the centre of literary gravity to the theatre, have been perhaps its most noticeable traits. The consequence is,

works of real imaginative value and artistic purpose are few and far to seek; while a flood of books, too often unripe, incomplete, and sadly lacking in clearness of thought, as well as artistic finish, have been poured all too profusely from the press. The only poet who anywhere near approaches the first rank is Detlev von Liliencron (1844). Elements of naturalness are shown by the minor poets J. G. Fischer (1816-97) and Volkmann-Leander (1830-89); and by the self-taught peasant Johanna Ambrosius (1854). Other names which may be mentioned in the field of poetry, though they are all more or less tinctured with the 'modern' spirit, are Avenarius, Falke, Fulda, Dehmel, Henckell, Mackay, Jacobowski, Busse, George, and Bierbaum; with the women—Marie delle Grazie, Isolde Kurz, Alberta von Puttkamer, Ricarda Huch, and Anna Ritter. The novelists, nearly all of whom were also dramatists, include Heiberg, Conrad, Bleibtreu, Kretzer, Alberti, Sudermann, Conrad, Schai, and Holz; and the women writers—who, speaking generally, excel the men—Ilse Frapan, Helene Böhlau, H. Villinger, and Clara Viebig. Frenssen has quite recently won a remarkable success with a fresh and striking novel *Jörn Uhl*. See J. G. Robertson's *History of German Literature* (1902); W. Seherer's *Geschichte der Deutschen Dichtung* (9th ed. 1902); A. Bartels's *Deutsche Dichtung der Gegenwart* (1901-2); and Gottschall's *Deutsche Nationalliteratur* (1891-2).

Germersheim, fort. tn., Bavaria, in Palatinate, on l. bk. of the Rhine, 24 m. by rail s. of Mannheim. Pop. (1900) 5,868.

Germinal, or BUDDING-MONTH, the 7th of the French revolutionary calendar, corresponding to March-April.

Germination is the process whereby a plant emerges from the seed when the latter is placed under suitable conditions. As the internal parts of the seed begin to swell, the pericarp splits and allows the radicle to protrude and descend, and the cotyledons to ascend, with (in the case of dicotyledons) the plumule between them.

Gernrode, health resort, Germany, in the duchy of Anhalt, on the N. slope of the Harz Mts., 16 m. by rail s.e. of Halberstadt. From about 960 to 1610 it was the seat of a famous abbey for women of noble birth, and has still an interesting 10th-century Romanesque church. Pop. (1900) 2,966.

Gernsbach, summer resort in the N. of the Black Forest, grand-duchy of Baden, Germany, on the Murg, 9 m. by rail s.e. of Rastatt. Pop. (1900) 2,679.

Gerok, FRIEDRICH KARL (1815-90), German poet and preacher, born at Vaihingen in Württemberg; became a preacher there in 1849. In 1868 he was appointed court chaplain at Stuttgart, and a member of the Supreme Consistorial Court. A religious poet of much talent, Gerok was the author of *Palmblätter* (1857), which has run into over one hundred editions (Eng. trans. 1869); *Pfingstrosen* (1864); *Blumen und Sterne* (1868); *Eichenlaub* (1871); *Deutsche Ostern* (1871); *Unter dem Abendstern* (1886). He also edited the *Hymns* of Paul Gerhardt (1883) and Luther (1882). See *Life*, in German, by Mosapp (1890).

Gerolstein, wat.-pl., Prussian prov. of Rhineland, 43 m. by rail N. of Treves. Pop. (1900) 1,200.

Gérôme, JEAN LÉON (1824-1904), French painter and sculptor, born at Vesoul; went to Paris in 1841, and became a pupil of Delaroche. He exhibited his *Cockfight* in the Luxembourg at Paris in 1847. He gained a great reputation as painter of Oriental and dramatic subjects, which show fine observation, precise drawing, and elaborate finish. He was one of the most refined of the Neo-Greek school, and in 1863 was appointed professor at the Ecole des Beaux-Arts in Paris. Among his best-known pictures are *The Duel after the Ball* (1857); *The Slave-Market* (1867); *The Ladies of the Harem out for a Drive* (1869); *The Age of Augustus*; *Ave, Caesar! morituri te salutant*; *Louis XIV. and Molière*; and *Napoleon III. receiving the Siamese Ambassadors*. During recent years his keen sense of form has been expressed in sculpture, such as his *Tanagra* (1890), *Luxembourg*; *Bacchus and Love* (1878); *Bellona* (1892); *Bonaparte entering Cairo* (1897); *Frederick the Great* (1899); and *The Wounded Eagle* (for Waterloo, 1904), etc. Three of his Oriental paintings are in the Wallace Collection, London.

Gerona. (1.) Province, N.E. Spain; is one of the richest provinces in Spain, forming part of Catalonia. Area, 2,264 sq. m. It produces abundant wine, timber, cork, etc., and its manufactures, especially of textiles, are very considerable; numerous coal mines, and fishing extensively carried on. Pop. (1900) 299,074. (2.) Ancient *Gerunda*, tn. and episc. see, cap. of prov. Gerona, Spain, 52 m. N.E. of Barcelona. It is one of the oldest cities in Spain, and still retains a mediæval aspect, though the suburb of El Mercadel is modern. Its chief architectural features are its churches, especially the fine 15th-century cathedral. Manufactures comprise paper, textiles, and cork; coal, iron, copper, and lead

are mined in the vicinity. Gerona is famous for its heroic defence against the French, June 8 to Dec. 10, 1809. Pop. (1900) 15,787.

Gerontius, COUNT, Byzantine general under the Emperor Constantine III.; revolted, and placed his friend Maximus on the throne. He besieged Constantine at Arles; but the appearance of the rightful heir, Honorius, was the signal for the troops of Gerontius to mutiny. Gerontius took his own life (A.D. 413).

Gerresheim, tn., Prussian prov. of Rhineland, 3 m. by rail E. of Düsseldorf; manufactures glass bottles and wirework. Pop. (1900) 11,541.

Gerry, ELBRIDGE (1744-1814), American politician, was born in Massachusetts; became a member of the Continental Congress of 1776, and during the four years in which he served was a vigorous advocate of the Declaration of Independence. In 1789 he was elected as a republican to the first National Congress. When governor of Massachusetts in 1810, he so redistributed the electoral districts of the state that it became safe for his own party; whence the term 'gerrymandering,' through the term 'salamanca,' which the electoral map of the state was said to resemble. He was vice-president of the United States from 1813 until his death. See *Life* by James T. Austin (1828-9).

Gerrymandering. See GERRY.

Gers, dep. in s.w. of France, between depts. Lot-et-Garonne on the N. and Hautes-Pyrénées on the S. Its area is 2,428 sq. m. River valleys radiate across it from the S., and enter the Garonne. The Adour crosses the s.w. corner. Over 15 per cent. of the surface is devoted to the cultivation of the grape, from which large quantities of brandy and wine are manufactured. There are practically no industries. Auch is the cap. Pop. (1900) 238,448, or 98.3 per sq. m.

Gersau, vil. and health resort on N. shore of Lake of Lucerne, canton Schwyz, Switzerland.

Gerson, JEAN CHARLIER DE (1363-1429), French divine, born of peasant parents at Gerson (dep. Ardennes). He was elected chancellor of the University of Paris in 1395, and used his great influence in endeavouring to purify the lives of the clergy, and in the universities he strove to supplant the scholastic theology by a more rational and evangelical type of religious thought. He also strove to terminate the papal schism at the councils of Pisa and Constance (1414). The enmity of the Duke of Burgundy forced him to spend some time in exile in Tyrol, and after returning to France (1419)

he retired into a monastery at Lyons, where till his death he was occupied in study and in teaching. At once a scholar and a mystic, he endeavoured to show the unity of these points of view in his *Considerationes de Mystica Theologia Speculativa et Practica*. His famous work, *De Consolatione Theologiae*, was written during his exile. The *Imitation of Christ* has been placed by some among his numerous writings, but without justification. His *Opera* were published in 3 vols. at Basel in 1518. See *Essai sur Jean Gerson*, by Charles Schmidt (1839); *Johannes Gerson*, by Schwab (1858).

Gerstäcker, Friedrich (1816-72), German novelist and author of works of travel, born at Hamburg; wandered on foot through the United States (1837-43). On returning to Germany he found that publication of the diary sent to his family had made him already known as a writer. Thenceforth he turned his literary talent to good account, producing *Die Regulatoren in Arkansas* (1845; 10th ed. 1897); *Flusspiraten des Mississippi* (1848; 10th ed. 1890); *Tahiti* (5th ed. 1877); *Nach Amerika* (1855); *Unter dem Äquator* (7th ed. 1902); *Inselwelt* (3rd ed. 1878); *Die beiden Sträflinge* (5th ed. 1881); *In Mexiko* (1871). His last journey through N. America, Mexico, and Venezuela is described in *Neue Reisen* (1868). An edition of his works, many of which have been translated into English, appeared at Jena (1872-9).

Gerstenberg, Henrik Wilhelm von (1737-1823), German critic and author, born at Tondern in Schleswig. From 1775-1883 he was Danish resident at Lübeck, and began his literary career with *Tündeleiten* (1759) and *Gedicht eines Skalden* (1766), the first attempt to revive Scandinavian mythology in German poetry, his best-known dramatic piece being *Ugolino* (1768). His *Briefe über Merkwürdigkeiten der Literatur* (1766-70) gave its first impulse to the *Sturm und Drang* school of German literature.

Gerster, Eteleka (1857), singer, born at Kassa (Kaschau) in Hungary; studied under Mme. Marchesi at Vienna. She made her début at Venice (1876), appeared in Berlin in 1877, and in 1877 in London.

Gertrude, Sr. (1256-c. 1303), German mystical writer, lived in the convent at Helfta, near Eisleben. *Exercises of St. Gertrude* (Eng. trans. 1863) is famous in mystic theology. See Ledos's *Sainte Gertrude* (1901), which analyzes the current confusion of St. Gertrude with the abbess of the same name.

Gérusez, Eugène (1799-1865), French *littérateur*, born at

Rheims; was assistant (1833-52) to Villemain, professor of eloquence at the Sorbonne. His publications include *Histoire de l'Eloquence en France aux XIV., XV., et XVI. Siècles* (1837-8); *Essais sur l'Eloquence et la Philosophie de Saint-Bernard* (1839); *Essais d'Histoire Littéraire* (1839); *Histoire de la Littérature Française jusqu'à la Révolution* (1852-61; 15th ed. 1882). This last, together with its sequel, *Histoire de la Littérature Française pendant la Révolution* (1859; 6th ed. 1877), is his principal production.

Gervase of Canterbury (?1141-1203), an English Benedictine monk, who wrote an account of the burning and rebuilding of Canterbury Cathedral, also *Actus Archiepiscoporum Cantuariensium* (ed. Stubbs, Rolls Series, 1879-80). He compiled a *Mapa Mundi*, containing a topographical description of England.

Gervase of Tilbury (d. 1235), English historical writer, is believed to have been a native of Tilbury in Essex. He seems to have been brought up in Italy, and to have studied and taught at Bologna. In 1183 he visited the English court, and later entered the service of William II. of Sicily, passing, about 1200 A.D., into that of the Emperor Otto IV. Appointed by him marshal of the kingdom of Arles, it was for Otto's benefit that Gervase composed the *Otia Imperialia* (c. 1212), which included a summarized history of the world from the creation, as well as a collection of curious legends and beliefs. The *Liber Facctiarum*, or 'Book of Anecdotes,' was compiled for Henry II. of England. The *Otia* was printed by Leibniz in *Scriptores Brunsvicensis*, vol. i. (1707-10).

Gervex, Henri (1848), French painter, born in Paris. His first success was *Bacchantes and Satyr*, exhibited in 1874, and afterwards purchased for the Luxembourg gallery in Paris. From mythological and Biblical subjects he proceeded to pictures of everyday life, marked by a vigorous realism. Among his best works are *Communion à l'Eglise de la Trinité* (1877); *Les Anatomistes* (1879); the *Hanging Committee of the Salon* (1885), in the Luxembourg at Paris; *Before the Surgical Operation* (1887); a portrait of Waldeck-Rousseau (1900); *The Coronation of Czar Nicholas II.* (1900); and several panels in the Hotel de Ville at Paris.

Gervinus, Georg Gottfried (1805-71), German historian, born at Darmstadt. The first volume (1835) of his *Geschichte der Poetischen Nationalliteratur der Deutschen* led to his appointment as professor of history and literature at Göttingen (1836). In 1837,

however, he was expelled from the university for taking part in the protest against the conduct of the king in setting aside the Hanoverian constitution. His *Geschichte des Neunzehnten Jahrhunderts* (8 vols. 1856-66) was preceded by an *Einleitung in die Geschichte des Neunzehnten Jahrhunderts* (1853), the strongly democratic tendency of which led to the author's prosecution and imprisonment. Foiled in his political efforts in the cause of German unity and advancement, Gervinus devoted himself entirely to literary work. Here belong his *Shakespeare* (1849-52), once a classic among Shakespearean commentaries, and *Händel und Shakespeare. Zur Aesthetik der Tonkunst* (1868). His *Geschichte der Deutschen Dichtung* (5th ed. 1871-4) was the first comprehensive survey of the course of German poetry viewed in connection with contemporary political and social influences. See *Gervinus*, by Gosche (1871), and *G. G. Gervinus Leben von ihm selbst* (1893).

Geryon. See **HERCULES**.

Gesenius, Friedrich Heinrich Wilhelm (1786-1842), German Orientalist and Biblical critic, born at Nordhausen; after some years of teaching, was appointed professor of theology at Halle (1810). Here he lectured for over thirty years. He is chiefly remembered for his works on Oriental philology and Old Testament criticism, among these being the *Hebräisch-deutsche Handwörterbuch* (1810-12; 13th ed. 1899); *Hebräische Grammatik* (1813; 27th ed. 1902, new Eng. ed. 1898); *De Pentateuchi Samaritani Origine, Indole, et Auctoritate* (1815); *Geschichte der Hebräischen Sprache und Schrift* (1815); *Der Prophet Jesaja* (1821-29); and the great *Thesaurus philologicus-criticus Linguae Hebraicae et Chaldaicae Veteris Testamenti* (1829-42), completed by Rödiger in 1858. In 1892, etc., appeared *A Hebrew and English Lexicon of the Old Testament*, based upon the *Heb.-deutsche Handwörterbuch*, enlarged with materials from the *Thesaurus*. Gesenius was one of the first to apply scientific methods to the study of Hebrew literature and philology. See *Gesenius, eine Erinnerung für seine Freunde* (1843); also *Memoir* by Hermann Gesenius (1886).

Geshur, an Aramean state of Palestine, E. of the Jordan and W. of Bashan. David married the daughter of its king (2 Sam. 3: 3), and his son Absalom sought safety in the kingdom after the murder of his brother Amnon. Some writers hold that another Geshur existed in the S.W. of Palestine.

Gesner, Johann Matthias (1691-1761), German classical

scholar, born at Roth (Ansbach); librarian and co-rector at Weimar (1715-29); rector of the gymnasium at Ansbach (1729-30); rector of the Thomas school at Leipzig (1730-4); and in 1734 became professor of poetry and rhetoric at Göttingen, where he died. His first work on the *Philopatris* (ascribed to Lucian) attracted much attention in 1714. He subsequently published *Novus Linguae et Eruditionis Romanae Thesaurus* (1749); editions of the *Scriptores Rei Rusticae* (1735), of Quintilian (1738), the younger Pliny (1739), and of Horace (1752), besides three classical anthologies. See *Narratio de Gesnero* (1762; reprinted 1891), by Ernesti.

Gesner, KONRAD VON (1516-65), Swiss naturalist, born at Zürich. Appointed professor of Greek at Lausanne in 1537, he returned to Zürich (1541) as professor of physics and natural history. His stock of learning has, for width and comprehensiveness, hardly been surpassed, and found its outlet in several *magna opera*. One of these, the *Bibliotheca Universalis*, or *Pandectarum sive Partitionum Universalium Libri* xlv., appeared from 1545 to 1555. It comprised a list of all books written in Greek, Latin, and Hebrew, with criticisms of the most important. His *Historia Animalium*, an encyclopædia of all known animals, appeared in 1551-8. Besides numerous minor works, he prepared a new edition of Ambrosius Calepinus's *Latin Dictionary*, and an edition of Martial (both 1544). See Autobiography in the *Bibliotheca Universalis*, and *Life* by J. Hanhart (1824).

Gesneraceæ, a natural order of plants which includes the genera Gesnera, Streptocarpus, and Gloxinia. The Gesneras are cultivated in Britain as stove plants in peaty soil. They are tuberous-rooted, and propagation is easily effected by separation of the tubers.

Gessi, ROMOLO (1831-81), Italian traveller, born at Constantinople. He entered the Egyptian service, and was sent to the Sudan, where, under General Gordon, he assisted in the survey of the Nile, and with Colonel Mason proved the connection of the Albert Nyanza with the Nile system (1876). In 1879 he was dispatched by Gordon against Suleiman and other slave raiders in the south, captured them, and returned to Khartum in 1881. See *Setti Anni nel Sudan Egiziano*, edited by his son (1891; Eng. trans. 1892).

Gessner, SALOMON (1730-88), Swiss poet, painter, and engraver, was born at Zürich, where he carried on a bookseller's business. He first attracted public

attention through his *Lied eines Schweizers* (1751), followed by *Daphnis* (1754), *Idyllen* (1756 and 1772), *Inkel und Yarike* (1756), a series of works the conventional insipidity of which reached a climax in *Der Tod Abels* (1758). Gessner's poems, however, achieved a wide popularity, especially in France, through Michael Huber's translations. Gessner's paintings were of a pastoral kind, but as an engraver he reaches a much higher level. See his *Briefwechsel mit seinem Sohn* (1801), and *Lives*, in German, by Hottinger (1796) and Wölflin (1889). —**KONRAD GESSNER** (1764-1826), son of the above, born at Zürich, achieved some celebrity as a landscape painter in the genre of Salvator Rosa. He was in England and Scotland in 1789-1804.

Gesta Romanorum ('Exploits of the Romans'), a collection of anecdotes written in mediæval Latin, compiled towards the end of the 13th or beginning of the 14th century. The nucleus is a series of stories from Roman history, whence the name, but supplemented by a great number of tales from other sources, Oriental and European. The style is poor and artless, showing very little dramatic power, though the book contains the germ of much that is admirable in subsequent literature—for instance, Chaucer's *Man of Lawes Tale*, and the outlines of *King Lear*. The first printed edition was issued at Utrecht in 1473. An English translation was published by Wynkyn de Worde about 1510-15. A good modern translation by Rev. C. Swan (1824; new ed. 1903) is in Bohn's Antiquarian Library. There are critical editions of the Latin text by A. Keller (1842) and Oesterley (1872).

Gestation is the term applied to the bearing of young in the womb from the time of conception to that of delivery. The period varies considerably in different species of mammals, and to a less degree in different individuals of the same species. In woman the average length of gestation is about 280 days, but may be both more and less. The period of gestation varies to some extent with the duration of the normal menstrual cycle, a woman of the 28-day type generally carrying a child longer than one of the 21-day type.

Variations in the duration of pregnancy have important legal aspects. French law recognizes as legitimate a child born six months after marriage. The same law assumes the possibility of gestation occupying 300 days. American legislators have recognized a gestation of 317 days. In England no legal decision has been given fixing the possible

limits of variation. Occasionally, as a result of the death of the child in the womb, the uterine contractions are not sufficiently strong to expel the fœtus when labour sets in. The pains pass off, and the uterine contents may be retained for weeks or even for months. Such a condition is termed 'missed labour.'

Among the lower animals those which are uniparous have, as a rule, comparatively lengthy gestation. Thus the elephant carries her young almost two years, the cow nine months, the mare eleven months, and the sheep twenty-one weeks. Among animals which bring forth litters the period of gestation is shorter—the bitch carrying her young sixty-two days, the rabbit about five weeks, and the rat about four weeks.

Gestrikland, part of the Swedish co. of Gefleborg, especially the coast land east of Dalarna.

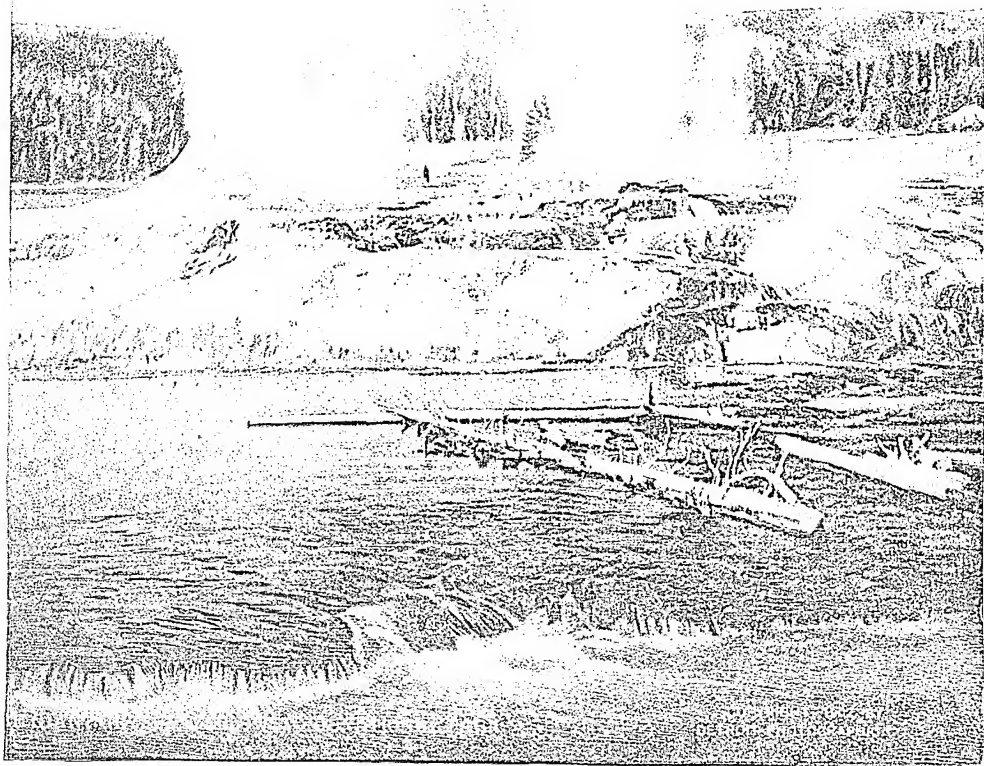
Geta, LUCIUS or PUBLIUS SEPTIMIUS (189-212 A.D.), second son of Septimius Severus and Julia Domna, and brother of the Emperor Caracalla. After he had received the consulship twice, and (in 209) the tribunician power and the title of Augustus, he was killed by Caracalla.

Geta, a Thracian tribe, whom the Romans called Daci. In the time of Alexander the Great they dwelt north of the Danube. Their name has caused some authorities to identify them with the Goths. In 515 B.C. they were subdued by Darius, king of Persia; in 335 B.C. Alexander the Great attempted to subdue them, but failed; Crassus defeated them in 28 B.C.; and in 106 A.D. they were conquered by Trajan, and their country incorporated in the Roman empire. See Rösler's *Die Geten und ihre Nachbarn* (1864); and compare DACIA.

Getafe, tn., prov. Madrid, Spain, 8 m. s. by w. of Madrid. It produces market stuff for the capital, and contains the principal cartridge factory in Spain. Pop. (1900) 4,444.

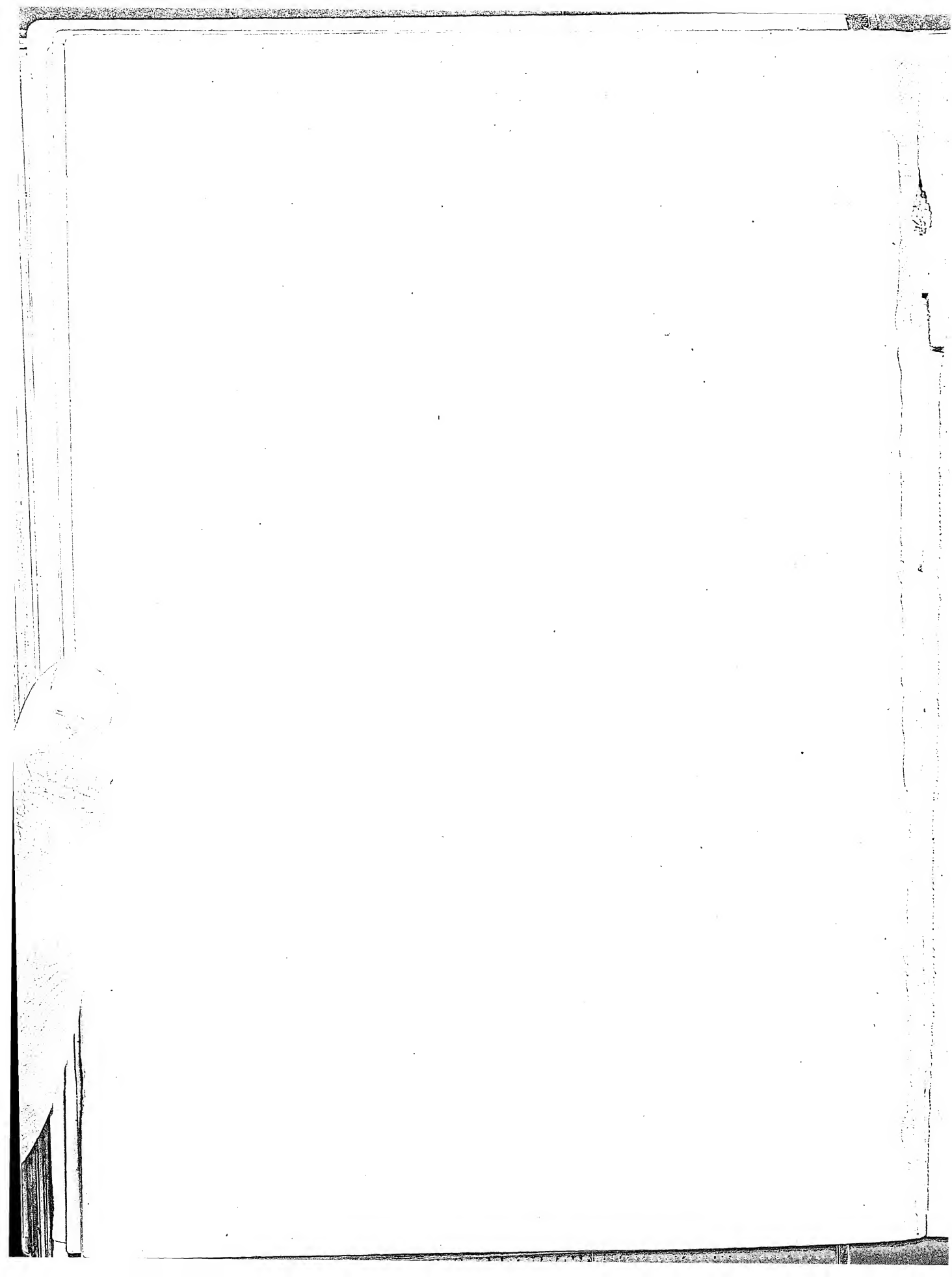
Gethsemane, a place near Jerusalem, the scene of our Lord's agony on the night preceding his crucifixion (Mark 14: 32). It was on the slopes of the Mount of Olives. The garden (John 18: 1) is identified with a square enclosure just across the Kidron from St. Stephen's Gate, but recent explorers think this too near the city.

Gethyllis, a genus of Cape bulbous plants belonging to the order Amaryllidaceæ. They require a light peaty soil and a cool greenhouse temperature. The flowers of all the species are white and sweet-scented, not unlike those of *Sternbergia* in form.



Geyser in eruption in Yellowstone National Park, U.S.A.

Geysers are almost entirely confined to Iceland, the Yellowstone National Park, and New Zealand, three volcanic regions, and are commonest in the Yellowstone region.



Gettysburg, cap. Adams co., Pennsylvania, U.S.A., 35 m. s.w. of Harrisburg. It is the seat of a Lutheran college (1832) and a theological seminary (1826). Here, during the first three days of July 1863, the Federals under Meade gained an indecisive victory over the Confederates under Lee. The battlefield is now a national park with over 400 monuments. The National Cemetery is surmounted by an elaborate monument with a statue of Liberty. See Battine's *The Crisis of the Confederacy* (1905). Pop. (1900) 3,495.

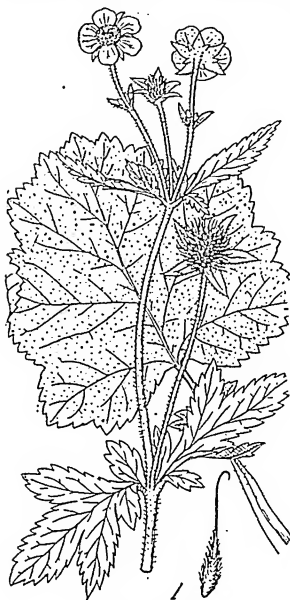
Geulincx, ARNOLD (1624-69), Dutch philosopher, born at Antwerp; lectured at Louvain University (1646-58). Compelled to resign his chair and leave the city, he took refuge at Leyden, where he obtained a philosophical professorship in 1665. His *Saturnalia* (3rd ed. 1660), *Logica* (1662), and *Ethica* (1666) are less important than the posthumous *Metaphysica Vera* (1691), and *Ἡ ὁλὴ ἀνθρώπου, sive Ethica* (1696). The *Annotata præcurrentia ad Cartesii Principia* appeared in 1690. He originated the theory of Occasionalism, holding that the co-existence of certain mental and physical phenomena is unconnected with any internal or mutual causation, but solely dependent upon the action of God at each moment. His *Opera Philosophica* (ed. Land) appeared in 3 vols. in 1891-3. See J. P. N. Land's *A. Geulincx und seine Philosophie* (1895); *Arnold Geulincx; Erkenntnistheorie und Occasionalismus* (1875), by Grimm; studies by Pfeiderer (1882), Samtleben (1885), and Van der Haeghen (1886).

Geum, a genus of hardy plants belonging to the order Rosaceæ. They are of decorative value, their red or yellow flowers being borne singly at the ends of the much-branching stems. *G. urbanum*, the common avens or herb-bennet of British hedgerows, bears yellow flowers in summer, followed by heads of awned seeds.

Gevaert, FRANÇOIS AUGUSTE (1828), Belgian musical composer and musical historian, born at Huyssse. He has composed many successful operas, both serious and comic; among others, *Hugues de Zomerghem* (1848), *Georgette* (1853), *Quentin Durward* (1858). In 1871 he became director of the Brussels conservatoire. He is equally distinguished as a writer on music, and has published *Histoire et Théorie de la Musique de l'Antiquité* (2 vols. 1875-81); *Les Origines du Chant Liturgique* (1890); *Nouveau Traité d'Instrumentation* (1886), a standard work; and he has edited *Les Gloires de l'Italie* (1868), a collection of Italian songs of the 17th and 18th centuries; and *Chansons du XV^e Siècle* (1875).

Gevelsberg, tn., Prussia, prov. Westphalia, 9 m. by rail n.e. of Barmen, with iron and steel works. Pop. (1900) 13,499.

Gex, tn., dep. Ain, France, 10 m. N.N.W. of Geneva. Has a trade in cheese and wine. Pop. (1901) 2,730.



Geum urbanum.
1. Awned seed.

Geyser (Icel. *geysir*), a fountain of hot water which intermittently gushes up to a great height. Geysers are almost confined to Iceland, the Yellowstone Park, and New Zealand, three volcanic regions; and they are commonest in the Yellowstone region. A geyser consists of a basin and a tube. The basin is formed above ground by the deposits (chiefly of silica) precipitated as the water evaporates, and often becoming like a crater. The tube leads beneath the surface, and in it, or in its expansions, water accumulates, is gradually heated until the pressure of the superincumbent water is overcome by that of the steam generated nearer the source of heat, and a column of hot water is projected through the tube high into the air, falling into and around the basin. The source of heat is probably uncooled lava, but it probably gradually cools, for geyser eruptions tend to diminish in frequency and regularity, and finally to cease. Old Faithful in the Yellowstone Park formerly emptied regularly every hour; now it does so more irregularly in from seventy to ninety minutes.

Gezer, referred to in Joshua 16:3, 10, etc., a city of Dan, Pales-

tine, in the low hills w. of the Jerusalem mountains, given up by Egypt to Solomon (1 Kings 9:15-17). It is noticed on monuments about 1500 B.C., as tributary to Egypt, and as attacked by the Abiri. The Palestine Exploration Fund has been excavating here since 1902, discovering a megalithic temple, troglodyte caves, pottery, and a cuneiform inscription (1904).

Gfrörer, AUGUST FRIEDRICH (1803-61), German historian, born at Calw (Black Forest); was librarian in the public library of Stuttgart. Devoting himself to history, he produced in 1831 *Philo und die Jüdisch-Alexandrinische Theosophie*, followed by *Gustav Adolf, König von Schweden* (1835-7). The anti-Protestant tone of the latter was still more seen in the *Kritische Geschichte des Urchristenthums* (1838), and especially in the *Allgemeine Kirchengeschichte bis Beginn des 14. Jahrhunderts* (1841-6). Appointed professor of history at Freiburg in 1846, he joined the Roman Catholic Church in 1853. Among his later works are *Geschichte der Ost- und West-fränkischen Karolinger* (1858); *Papst Gregorius VII.* (1859-61); and *Geschichte des 18. Jahrhunderts* (1862-73).

Ghadames. See GADAMES.

Gharbieh, prov., Lower Egypt, the northern portion of the area between the main arms of the Nile delta. Area, 2,340 sq. m. Pop. (1897) 1,297,656.

Ghardaia, GHARDEIA, or GARDALIA, tn., Algeria, 85 m. N.W. of Wargla oasis. It has a caravan trade in oil, dates, ostrich feathers, and pottery. It was surrendered to the French in 1857. Pop. (1892) 39,000.

Gharial. See GAVIAL.

Ghasel, or GHAZAL, in Persian lyric poetry, a form of short ode of from five to sixteen couplets, the second lines of which are set to one rhyme, the poet's pen name being frequently introduced into the last couplet. It was used for love songs, aspirational hymns, etc. The poet Hafiz (14th century) in his *Divân*, which is a collection of ghasels, set the true form, and it was more or less copied by his successors.

Ghats, or GHATS (Sans. 'a stair' or 'mountain pass'), two ranges of mountains, the Eastern and Western, of Southern India. The Western range, starting from the Tapti valley, hugs the shore in a precipitous and almost unbroken ramp of trap rocks at an elevation of from 3,000 to 7,000 ft. The principal passes are the Thalghat and the Bhor-ghat, both N. of Bombay. On the landward side the Western Ghats appear as low hills forming the edge of the plateau. The Eastern Ghats, more broken, have an

average elevation of 1,500 ft., and traverse the Madras Presidency, starting from its N.E. extremity. Most of the rivers which have their source in the Western Ghats find their way to the sea through the eastern hills; and both ranges are studded with sanatoria and health resorts.

Ghazali, or **GHAZZALI**, **ABU HAMID MOHAMMED IBN-AHMED**, **EL**, Oriental philosopher (1058-1111), commonly known as **Algalzel**, was born at Tus, in Khorasan; became a teacher at Bagdad (1091), but spent some years in travelling and teaching at Damascus, Jerusalem, and Alexandria, and the closing years of his life in the study and exposition of Sufism at Tus. Ghazali represents the sceptical, or rather (using the word in the Kantian sense) the critical, side of Arabian philosophy, for in his quest after truth he was led to examine, and to some extent to doubt, the accepted metaphysical teachings of the Arabian exponents of Aristotelianism. His principal work, *The Overthrow of the Philosophers*, may be found in the Latin translation of Averroes's *Opera* (eds. 1472, 1552). The introduction to it, known as *Logica et Philosophia Algalzelis Arabis*, is a general exposition of Arabian Aristotelian philosophy. See his mental autobiography, *Concerning the True Condition of Things* (trans. in Schmölders's *Essai sur les Ecoles Philosophiques chez les Arabes*, 1842).

Ghaziabad, tn., Meerut dist., United Provs., India, 15 m. N.E. of Delhi. It exports grain, hides, and leather. Pop. (1901) 11,275.

Ghazipur, chief tn. of Ghazipur dist., United Provs., India, on l. bk. of Ganges, 44 m. N.E. of Benares. It contains the ruins of the palace of Forty Pillars (now used as a custom-house), and a marble statue of Lord Cornwallis, who died here in 1805. Ghazipur is the headquarters of the opium department, and manufactures rose-water and attar of roses. Pop. (1901) 39,429. The district, which forms part of the great alluvial plain of the Ganges, has an area of 1,478 sq. m. Pop. (1901) 913,818.

Ghaznevids, an Uzbek (Turkish) dynasty, founded by a slave, **Alpteghin** of Bokhara, at Ghazni (in modern Afghanistan), in 962. His immediate successors, **Sebukteghin** (976-998) and **Mahmud** (998-1030), more especially the latter, extended their sway over Kabul, Peshawar, and Lahore on the north and east, and as far as Bagdad and the Caspian on the west and north-west. Mahmud maintained a magnificent court at Ghazni, among its chief ornaments being the poet **Firdausi** and the philosopher **Avicenna**.

The dynasty lasted until 1184, although its power was overthrown by the ruling sovereign of Ghur in 1152. After that princes of the Ghur dynasty ruled at Ghazni, until the destruction of the city by the Mongols under **Jenghiz Khan** in 1224.

Ghazni, **GHUZNEE**, or **GAZNA**, tn. and fort, Afghanistan, on the Ghazni R., 80 m. S.W. of Kabul, stands 7,710 ft. above sea-level. In the 12th century it was the capital of the kingdom of the Ghaznevids. On July 21, 1839, the fortress capitulated to the British; and in 1842 General **Nott** stormed the fort and razed it to the ground. It possesses two notable towers, and the tomb (or its site) of **Mahmud**. The famous 'gates of Samnath' were kept here from about the year 1000 A.D. to 1842, when they were taken to Agra.

Ghebers. See **PARSEES**.

Ghee. See **GHI**.

Gheel, tn., prov. Antwerp, Belgium, 26 m. by rail E. of Antwerp. Since the 13th century insane persons have been here 'boarded out' with heads of families, by whom they are employed and controlled. The free-air treatment, the association of the insane with the sane, the domesticity, and the general good results observable at Gheel have attracted considerable attention in Britain and the United States, and have led to the introduction of cottage hospitals in lieu of the older asylums. Pop. (1900) 13,070. See **LUNACY**.

Ghent, also **GAND** and **GENT**, city, chief tn. of prov. E. Flanders, Belgium, stands on the Scheldt and Lys, 35 m. by rail W. by N. of Brussels. It still preserves much of its mediæval character, although modernized since 1875. The town is a manufacturing centre, and produces cottons and linens, lace, sugar, machinery, iron, and leather-work, and grows azaleas, camellias, and other greenhouse plants for export. A canal (over 21 ft. deep), connected with the Wester Scheldt, allows sea-going vessels to reach the city. Ghent is an episcopal see; its cathedral, dating from the 10th century, contains a notable altar by the **Van Eycks**, a famous picture by **Rubens**, and a good carved pulpit. The belfry (12th century), the fine Gothic town hall (15th century), the Counts' Castle (the former residence of the counts of Flanders), the provincial archives in the **Geeraard-Duivelsteen**, the great Friday market abounding with historical associations, the Institute of Sciences—one of the most imposing edifices in Belgium—the lawcourts (1836-44), and some ancient churches are the principal features of the centre of the city. Outside the ancient city proper lie (going from N.W. to N.E., and

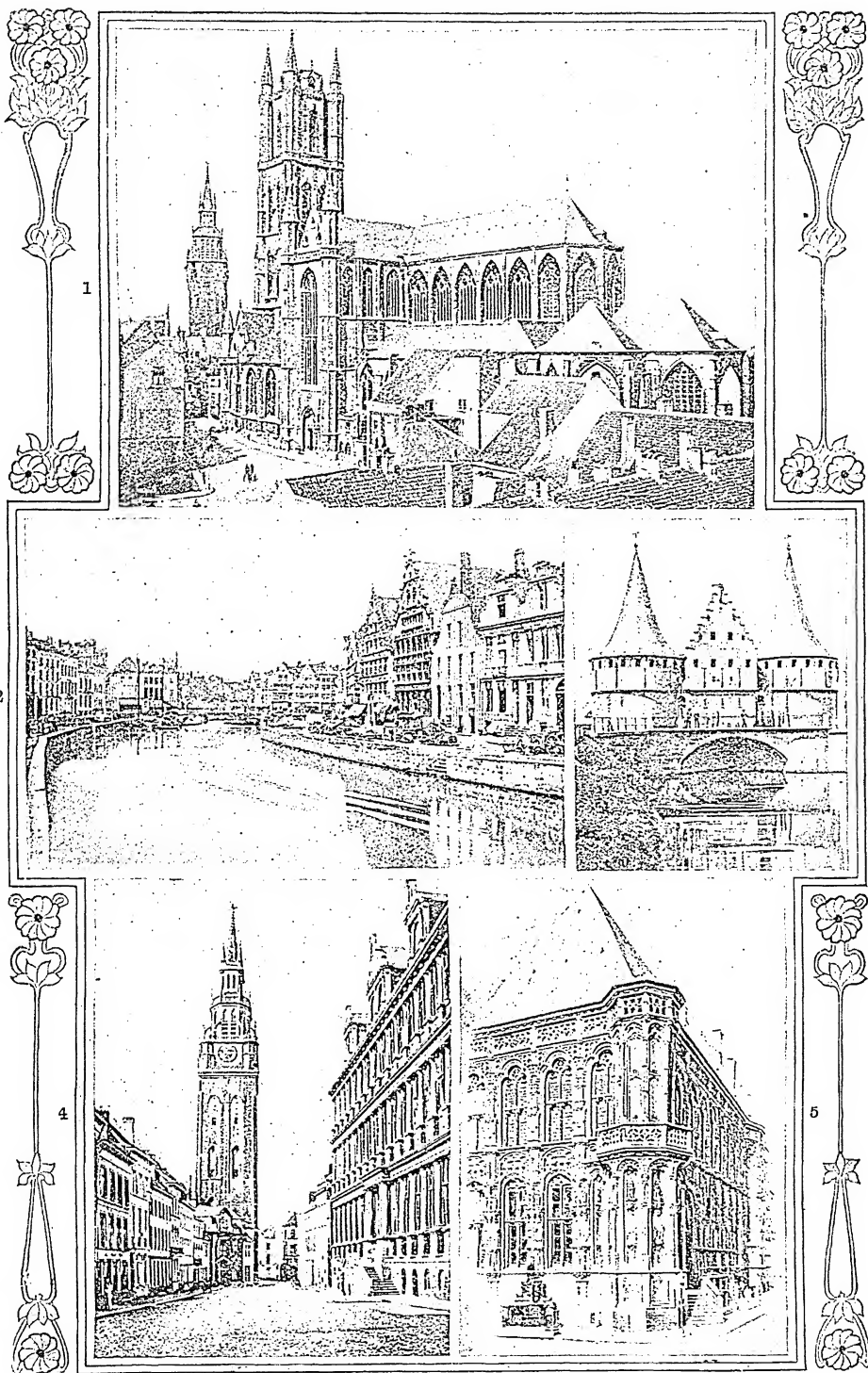
so round) the **Archæological Museum** (1884) and **Picture Gallery**, the **Great Béguinage** or convent of the **Béguines**, the ruins of the ancient abbey of **St. Bavon**, the **Little Béguinage** (13th century), the **Citadel Park** (1870), and the botanical and zoological gardens. Ghent is the seat of a university, founded in 1817, but since 1834 a peculiarly Flemish institution, and now attended by some 410 students. Ghent contains several other interesting mediæval houses and public buildings—e.g. the **Stapelhuis** (12th century), the **Schifferhuis** (1531). The city is defended by a modern citadel (1822-30). Its history is distinguished by two periods of special prosperity—the first, in the middle of the 14th century, when its fortunes were guided by **Jan van Artevelde** and his son **Philip**, and it was a powerful ally of **Edward III.** of England; and the second under the favour of the Emperor **Charles V.**, who was born within its walls (1500). At the latter period it numbered some 200,000 inhabitants; but its prosperity was destroyed by **Charles** himself (1540), by the **Spaniards** under **Alva** (1567), and by **Alexander Farnese** (1584). In 1706 it was occupied by **Marlborough**; and in 1814 peace was signed in the city between England and the United States. At the present time it is a centre of the socialist party in Belgium, as well as of the Flemish nationalist movement. It possesses a Flemish academy and a Flemish theatre. Pop. (1900) 160,133.

Gherardesca, **UGOLINO**. See **UGOLINO DELLA GHERARDESCA**, **COUNT**.

Ghetto, the Jews' quarter, or **Jewry**, in Italian and other cities. In the middle ages the inhabitants lived quite apart from their Gentile neighbours, crowded together in a few narrow, filthy streets, with synagogues and schools, to say nothing of manners and customs, of their own. In England important 'Jewries' existed in London, York, Lincoln, and Oxford. See **Heine's Rabbi von Bacharach**, stories by **K. E. Franzos**, **Philipson's Old European Jewries** (1894), and **I. Zangwill's** novels.

Ghi, or **GHEE**, clarified butter, used dietetically, medicinally, and ceremonially by Indian and Sinhalese natives, is prepared by melting butter from cow's or buffalo's milk, and separating the curd and water. Sour milk, or *dhye*, salt, and betel leaf are sometimes added during the operations. An inferior product is a mixture of the curdy residue with ground-nut oil. **Ghi** keeps better than ordinary butter.

Ghibelline. See **GUELF** AND **Ghibelline**.



Views in Ghent.

1. Cathedral of St. Bavo. 2. Quai aux Grains. 3. Porte Le Rabot. 4. The Belfry. 5. Hôtel de Ville.

Ghiberti, LORENZO (1381-1455), Italian worker in bronze, architect, and painter, born in Florence. In 1400 he fled from the plague in Florence, and painted frescoes in the palace at Rimini. Returning to Florence, he was commissioned to design the bronze doors of the baptistery. He began the work in 1403, and completed it in 1424. These doors show a marked development in the art of sculpture since the days of the Pisani, in suavity of line and naturalness of figure. In 1417 he executed reliefs for the font at Siena, and was joint-director with Brunellesco and Battista d'Antonio of the works of the cathedral. His great masterpiece, however, the second bronze doors of the baptistery, a series of panels treating the Old Testament history, was commenced in 1425 and completed in 1452. The doors are treated in a style that is pictorial in composition—with remarkable aerial and lineal perspective—rather than in a strictly sculptural manner. He also executed many commissions for monuments in San Michele, Santa Croce, Santa Maria Novella, the cathedral, and elsewhere. See Leader Scott's *Ghiberti and Donatello* (1882); the *Commentari di Ghiberti* (trans. into French in Porkins's *Ghiberti et son Ecole*, 1897); and Schmarsow's *Ghibertis Kompositionsgesetze*.

Ghika, HELENA (1828-88), Roumanian authoress, is perhaps best known by her pseudonym of Dora d'Istria. The daughter of Prince Michael Ghika, she was born at Bucharest. From 1855 she resided mostly at Florence. Among her chief works (written in French) are *La Vie Monastique dans l'Eglise Orientale* (1855); *Les Femmes en Orient* (1859); *Gli Albanesi in Rumenia, Storia dei Principi Ghika nei Secoli XVII.-XIX.* (1873). See Cecchetti's *Dora d'Istria* (1871).

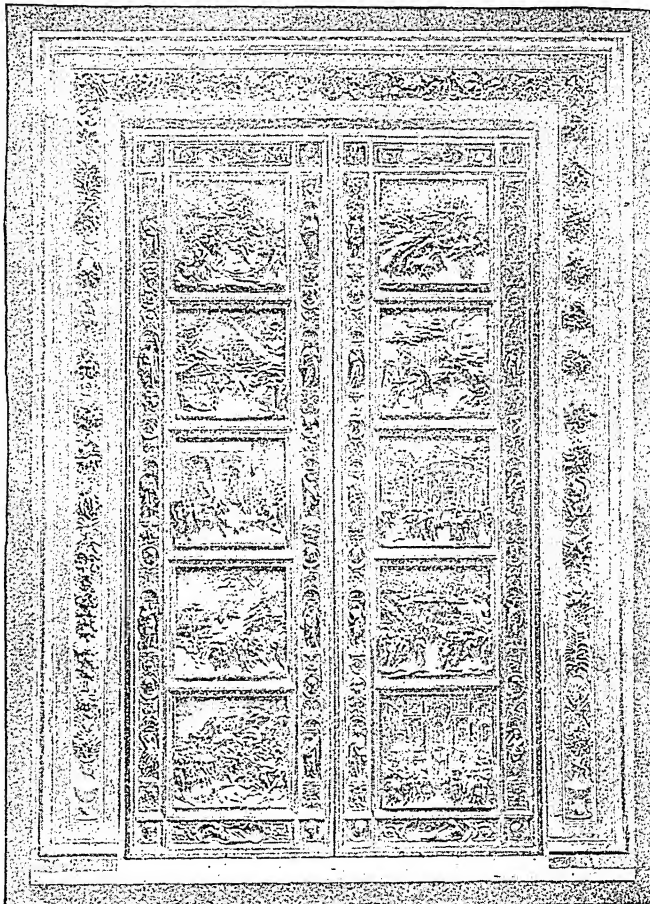
Ghika, JON (1817-97), Roumanian statesman, born at Bucharest; took a leading part in preparing the revolution of 1848 in Wallachia. The Sultan in 1854 appointed him governor of Samos, and in 1856 made him Prince of Samos. Returning to Bucharest Ghika became (1866) president of the council and minister of foreign affairs in the provisional government, and played the chief part in the establishment of the hereditary principality of Roumania in the same year. Under the new constitution he was twice prime minister. From 1881 to 1890 he was Roumanian minister in London. Of his writings, which are among the most remarkable in the Roumanian language, the following are the best known: *Convorbiri Economice* (1866-73); *Letters to V.*

Aleksandri (2nd ed. 1887); *Memories of Exile* (1890); he also translated several of Shakespeare's dramas into Roumanian.

Ghilan. See GILAN.

Ghilzai, a Pathan tribe of S.E. and N.W. Afghanistan; a tall, stalwart race of shepherds and farmers, cruel, and suspicious of strangers. In the retreat from Kabul in 1842 they hovered on the flanks of the British force, and almost completed its anni-

was the son of a Florentine goldsmith and maker of jewelled garlands. Assisted by his two brothers and his brother-in-law, Mainardi, he produced large works in *tempera*. The earliest remaining (dated 1480) are frescoes of *St. Jerome* and *The Last Supper*, in the church of the Ognissanti, Florence. After being commissioned to paint a series of subjects in the Palazzo Vecchio and in a chapel at San Gemi-



The famous Bronze Doors of the Baptistery, Florence, called the 'Gates of Paradise,' the Masterpiece of Lorenzo Ghiberti.

hilation. The Ghilzais profess Mohammedanism, but interesting evidences of a primitive Christianity have been discovered in some of their practices. They speak the Afghan language. According to their own tradition they are of Turkish origin.

Ghirlandajo, a family of Florentine artists. (1.) DOMENICO DI TOMMASO CURRADI DI BIGORDI (1449-94), surnamed IL GHIRLANDAJO, or the Garland-maker,

gnano, he was summoned to Rome about 1484 to assist in decorating the Sistine chapel. His masterpieces are the Sassetti chapel in Santa Trinità and the choir of Santa Maria Novella, Florence. See Steinmann's *'Ghirlandajo'* in Knackfuss's *Künstler Monographien* (1897). (2.) DAVIDE (1452-1525), Italian painter, brother of Domenico, born at Florence; was chiefly employed with his other brother (3.) BENEDETTO (1458-97)

in assisting Domenico, some of whose works they completed. Davide also executed mosaics at Orvieto, Siena, and Florence, where he was master of the guild. He managed his brother's business details. (4.) RIDOLFO (1483-1561), son of Domenico, became as noted in casel as his father was in mural painting. Raphael entrusted drapery to him. Ridolfo worked for the grand duke of Florence on the public palace, and in the monastery of the Angeli, also arranging festival and funeral processions for the Medici. His best pictures are at Florence, St. Petersburg, and Berlin.

Ghizeh. See GIZEH.

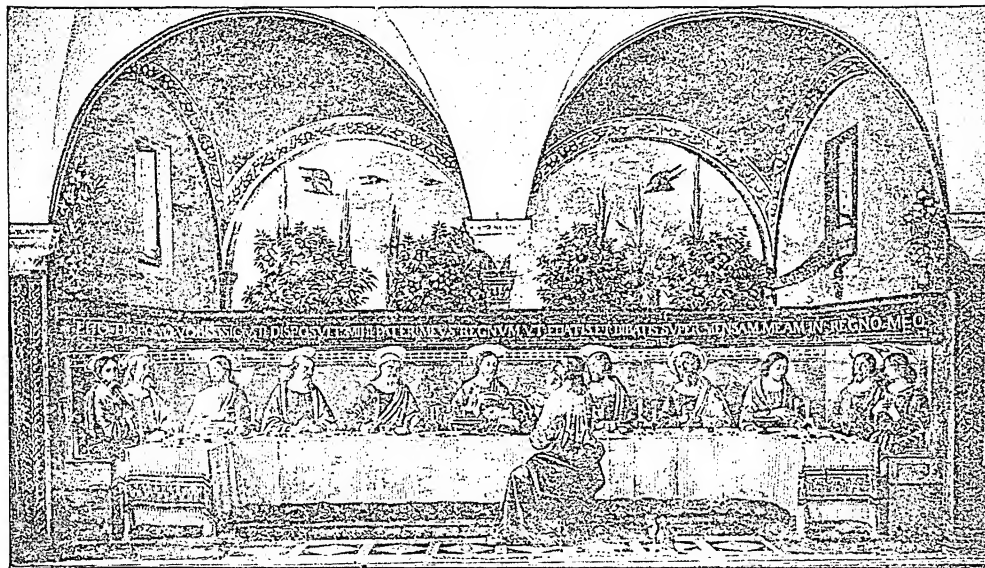
Ghoorkhas. See GHURKAS.

Ghost-moths are members of the family Hepialidæ, and are re-

ed-Din, carried their victorious arms as far east as Lahore and westwards as far as Kurdistan. Out of these victories grew the Mogul kingdom of Delhi. The power of the Ghuri dynasty was broken soon afterwards (1214-16) by Mohammed Shah and his son Jelal ed-Din of Khwarezm (Khiva). But there was a revival of the power of the Ghuri under the Kurt dynasty about 1245, until it was overthrown by Timur the Great in 1380, and again in 1383.

Ghurkas, a race of hardy mountaineers in Nepal, who, of Rajput descent, acquired sovereignty (1767-8) over the aboriginal inhabitants of the country. The East India Company came into collision with them (1814-18), and

Giannone, PIETRO (1676-1748), Neapolitan historian, was a native of Ischitella, Capitanata. While practising law at Naples he composed his great history (whereon he spent twenty years), *Storia Civile del Regno di Napoli*, published in 1723 (Eng. trans. 1729-31). Its severe strictures on the spirit and practices of the modern Roman Catholic Church so enraged the ecclesiastical party that Giannone was excommunicated and forced to retire to Vienna (1723), then to Venice, and later to Geneva. Here he composed his famous diatribe *Il Trirregno*, in which he attacked the papal authority with increased vigour. His *Anecdotes Ecclesiastiques* (1738) were republished in *Opere Postume* (1760); his later



'The Last Supper,' a Fresco by Domenico Ghirlandajo, in the Church of the Ognissanti, Florence.

markable for their pale colours. In some instances the wings are white above and brown below, so that in twilight the moths now appear and now disappear, according as the upper or lower surface catches the eye. The largest British example is *Hepialus lupulinus*.

Ghosts. See PSYCHICAL RESEARCH.

Ghur, a region of Asia, near Herat in Afghanistan, stretching towards Kandahar, and coincident in part with the ancient Paropamisus. In the 12th century it became the centre of a native dynasty, the Ghuri, the founder of which, Ala ed-Din Jahan-soz, in 1152 captured, sacked, and burnt Ghazni. This prince and his two successors, his nephews Ghiyas ed-Din and Muiz Shahab

in 1816 obtained possession of the southern slopes of the Himalayas, but consented to recognize the independence of Nepal. The Gurkas, onlisting in the British Indian army, proved loyal in the mutiny, and since then have given proof of their valour in other conflicts on the Indian frontier.

Gianibelli, or GIANBELLI, FEDERIGO (?1530-?1592), Italian military engineer, was a native of Mantua, but settled at Antwerp, and was engaged in the defence of this city against the Duke of Parma (1584). Antwerp having fallen, he went to England, where he assisted in the preparations against the Armada by designing fortifications for Greenwich and the adjacent coasts. The fire-ships sent into the Spanish fleet were designed by him.

works appeared as *Opere Inedite* (ed. Mancini, 1859). See *Life*, in Italian, by Panzini (1821), and Pierantoni's *Autobiografia di P. Giannone* (1890).

Giants. 'Giantism,' regarded as a disease, is closely connected with the disease known as acromegaly (which chiefly manifests itself in an enlargement of the hands and feet), which is caused by a certain morbid process in the sphenoid bone of the skull—viz. an excessive development of the anterior lobe of the pituitary body. When this condition does not become active until after the age of twenty-five, by which time the long bones are consolidated, the result is acromegaly; but if it appears in early youth, then the whole of the limbs are affected, and the stature becomes gigantic.

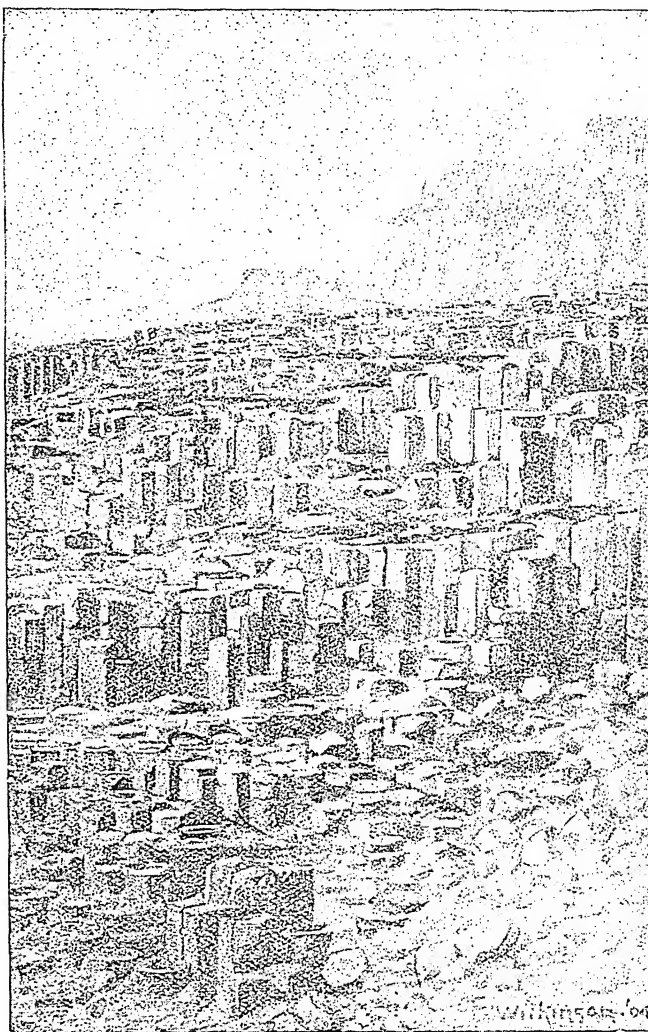
Such giants are usually dull in intellect, feeble and ungainly in figure, and short-lived. Magrath, the Irish giant (b. 1736, d. 1760), who was 7 ft. 5 in. in height, was a typical instance. Chang, the Chinese giant (7 ft. 9 in.), appears to have been an exception to the rule, as is also the case with perhaps the biggest of all giants, the Russian Machnow, who appeared at the Hippodrome, London, in 1905. Machnow is twenty-three years old, stands 9 ft. 3 in., and is well proportioned in every way. (See Wood's *Giants and Dwarfs*, 1868.) But human skeletons of extraordinary size have been found in the Mentone caves and in Scotland; and as in one instance (*viz.* at Logie-Pert, Forfarshire) five such skeletons were found together, it is obvious that there, as at Mentone, the 'giantism' was racial, and not the result of disease. Dr. Beddoe states that the tallest men now living in the British Isles are the villagers of Balmaclellan, in Galloway, their average height being 5 ft. 10¹/₄ in. These, with other isolated examples, point to the former existence of a very tall race—a race taller than the often-cited Tehuelches of Patagonia, whose average height is only 5 ft. 10 in. 'The Highland giants were not so big but that their conquerors wore their clothes,' observes J. F. Campbell of the *famhaircan* of Gaelic legend. *Famhaircan* signifies literally 'mole-men'; and the people so designated lived in underground dwellings. (See EARTH-HOUSE.) Teutonic tradition, as Grimm points out, describes the same kind of 'giants' under the name of *etins*. It may be noted that the inhabitant of the 'Dwarfie Stone' of Hoy, Orkney, who is styled a 'giant' in some accounts and a 'dwarf' in others, occupied a cell only 5 ft. 8 in. long.

Giant's Causeway, a remarkable group of basaltic rocks on the N. coast of Co. Antrim, Ireland, 8 m. E.N.E. of Portrush. It consists of a vast number of columns, generally pentagonal or hexagonal. The causeway proper is a low promontory formed of closely-packed columns. Altogether there are about forty thousand pillars, fitting into each other most perfectly, and jointed horizontally. Various more or less detached groups are known as the Giant's Loom, Giant's Organ, Lady's Fan, etc. East of the causeway proper is the Giant's Amphitheatre, a small bay with cliffs 350 ft. high, formed in its upper part of two tiers of basaltic columns from 60 to 80 ft. in height. Beyond this is Spanish Bay, the scene of the wreck of an Armada vessel; and still farther E., the noble promontory of Pleaskein

Head, 400 ft. high, with double tiers of lofty columns separated by a band of ochre. The peculiar columnar structure of the causeway rocks is shown by geologists to result from the contraction in cooling of the lava of which they are composed. The Giant's Causeway derives its name from the legend which

great ice-sheets of the Ice Age, falling down a crack or crevasse, and boring out the rock beneath by the force of its direct impact and the grinding effect of the stones and sand it carried with it. Fine examples are to be seen in the 'glacier garden' of Lucerne.

Giaour ('unbeliever') is the English form of a word used by



Giant's Causeway, showing columnar structure.

ascribes its construction to Finn M'Coul or Fingal, who bridged the channel between Ireland and Scotland, in order that the giants might pass from Antrim to Staffa.

Giants' Kettles are deep pot-shaped holes found in Norway, Sweden, N. Germany, and Switzerland. It is supposed that they are due to water flowing in the

the Turks to denote an adherent to any religion except the Mohammedan, but more particularly a Christian. It is generally, if not always, used in an offensive sense, as in Byron's

'And though to-morrow's tempest
lower,
'Tis calmer than thy heart, young
Giaour.'

Giardini, FELICE DE' (1716-96), Italian violinist, born at Turin, was the first great violin virtuoso heard in London (1750). Jomelli checked his habit of interpolating passages to display technique by boxing his ears in public. He proved an excellent leader at the Italian Opera (1752); but failure marked his management there (1756 and 1763-5), as well as in comic opera at the Haymarket in 1790. In 1791 he went to Moscow. Works: *Ruth* (an oratorio), and violin music.

Giaring-cho, KYARING-CHO, or TSATING-TSO, large lake of Central Tibet, situated under 32° N., and on 89° E. Alt. 15,000 feet.

Giarre, tn., Sicily, Italy, prov. Catania; stands between Mt. Etna and the sea, 19 m. by rail N. of Catania. Its wines are famous. Pop. (1901) 26,194.

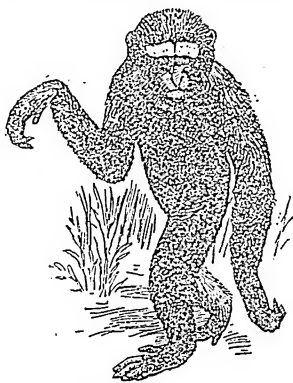
Giaveno, tn., N. Italy, on the l. bk. of the Sangone, 17 m. W. of Turin. It has cotton and jute factories. Pop. (1901) 11,618.

Gib, ADAM (1714-88), Scottish divine, born at Castletown, Perthshire; ordained to an Edinburgh charge; zealously supported the Protestant succession in 1745. He became leader of the Anti-Burgher party when the Secession Church divided (1747). He was the author of *Proceedings of the Associate Synod* (1748). Though a courageous fighter for truth, he was so autocratic in manner as to be called 'Pope Gib.'

Gibbet, originally synonymous with gallows. Later it came to mean an upright post with projecting arm, from which the bodies of criminals were hung in chains after execution. An elaborate specimen existed at Montfaucon, near Paris. The gallows for London executions was at Tyburn, and afterwards in front of Newgate from 1783 to 1868. Bodies were permitted to hang on gibbets, as a salutary warning to passers-by. The last instance of the practice was in 1839. See Hartshorne's *Hanging in Chains* (1891), and *Halifax and its Gibbet Law* (1789).

Gibbins, HENRY DE BELTGENS (1865), British writer on economic subjects, born at Port Elizabeth, Cape Colony. He won the Cobden prize in political economy at Oxford (1890), and was successively a master at Nottingham High School, vice-principal of Liverpool College, Liverpool (1895-9), and headmaster of King Charles I. School, Kidderminster (since 1899). He is author of *English Social Reformers* (1892), *The English People in the Nineteenth Century* (1898), *Industrial and Commercial Progress of the Nineteenth Century* (1901), *Economics of Commerce* (1905). He edits the series *Social Questions of To-day*.

Gibbon (*Hylobates*), the least specialized and the smallest of the four living types of anthropoid apes, is found in the Malay Peninsula and its vicinity. The largest does not exceed three feet in height, and when standing upright, the animals can touch the ground with their fingers. The face is more like that of man than are those of the chimpanzee and gorilla, but the tusks are long and prominent. The hands and feet are long and slender. In disposition the gibbons are gentle, and, if captured young, are easily



Hoolock Gibbon.

tamed. They are too delicate to stand the climate of Europe, but thrive well in captivity in India. The diet is very varied, fruits, leaves, shoots, insects, eggs, young birds all being eagerly devoured. The genus *Hylobates* comprises several species. One of the best-known is the hoolock (*H. hoolock*) of India. Another is the siamang (*H. syndactylus*), from Sumatra, and perhaps also the Malay Peninsula. Both are remarkable for their powerful voices, and the howling cries with which they salute the rising sun.

Gibbon, EDWARD (1737-94), English historian, was born at Putney. Gibbon was for two years at Westminster School, and was then placed for a few months under the Rev. Philip Francis, translator of Horace, and father of the alleged author of the *Letters of Junius*. But the real education of the boy had been proceeding, not in the schoolroom, but in his father's or grandfather's library. 'My indiscriminate appetite,' he says, 'subsidized by degrees in the historic line. All the Greek and Roman historians that I could find were greedily devoured, from Littlebury's lame *Herodotus* and Spelman's valuable *Xenophon* to the pompous folios of Gordon's *Tacitus* and a ragged *Procopius* of the beginning of the last century.'

At Oxford he continued his own luxurious browsings in the records of the past. His reading had now taken a theological turn: he studied Bossuet's *Histoire des Variations*, and 'falling,' as he says, 'by a noble hand,' he resolved to profess himself a Roman Catholic. The consternation which the announcement of his conversion caused in the house of the jolly Protestant squire, his father, may be imagined. The decree went forth that the young student should at once leave Oxford and be settled at Lausanne under the roof and tuition of M. Pavilliard, a Calvinist minister.

The five years of Gibbon's life (July 1753 to April 1758) which he passed in Switzerland were without doubt the most important for forming the character of the future historian. At first the material discomforts of his situation told heavily on his spirits. From a man's freedom he found himself 'degraded to the dependence of a schoolboy.' His elegant apartment in Magdalen College was exchanged for 'a small chamber in a gloomy street, warmed by the dull invisible heat of a stove.' But he found compensation in his intellectual intercourse with M. Pavilliard, who 'tempted me,' he says, 'from the blind and undistinguishing love of reading into a path of useful instruction.' It is evident that the years spent at Lausanne gave the needed thoroughness and stability to the fabric of Gibbon's mental endowment, especially in his study of the classics, and that at the same time he attained great facility in the use of the French language, becoming, according to his own account, a Frenchman rather than an Englishman. He entirely renounced his connection with the Roman Catholic Church, and conformed outwardly to the Protestant worship.

It was during his residence in Switzerland that the one celebrated and solitary love passage of Gibbon's life agitated his placid soul. Mademoiselle Susanne Curchod, the daughter of a Protestant pastor in a little village of the Jura, on a visit to some relations at Lausanne, excited the young Englishman's admiration by her wit, beauty, and erudition. He made her an offer of marriage, and was accepted. But on his return to England he was commanded by his father to renounce all thoughts of this strange alliance. In his own oft-quoted words, 'I sighed as a lover, I obeyed as a son.' Mademoiselle Curchod became the wife of the Swiss banker Necker, afterwards the famous minister of Louis XVI. It seems probable, however, that some remembrance of her mother's disappointment sharpened the

pen of Madame de Staël when she sketched the character of the young Englishman, Lord Oswald, in her novel of *Corinne*.

In the year 1761 Gibbon published his first book, a modest little volume in French, entitled *Essai sur l'Etude de la Littérature*. Short as it is (consisting of only 158 small pages), it is difficult now to read a book which is meant to lead up to this trite conclusion: *Voilà quelques réflexions, qui m'ont paru solides sur les différents usages des belles lettres. Heureux si je pouvais en inspirer le goût.*

Gibbon held a commission in the militia, and when that force was disbanded at the close of the Seven Years' war he entered upon the long-anticipated pleasure of the 'grand tour'. He was absent for two years and a half (January 1763 to June 1765). He spent more than three months at Paris; he wintered at Lausanne; but the thirteen months which he spent in Italy (April 1764 to May 1765) were the most fateful for the determination of his future career. 'It was,' he says, 'the view of Italy and Rome which determined my choice of a subject. In my *Journal* the place and moment of conception are recorded—the 15th October 1764, in the close of the evening, as I sat musing in the church of the Franciscan friars.' But eight years elapsed after his return to England before he first put pen to paper to write the *Decline and Fall*. These years were partly occupied by attendance on his father, whose health had begun to decline, and who died in 1770. Five years of reading were followed by three years of writing, and in February 1776 the first quarto volume of the *History of the Decline and Fall of the Roman Empire* was given to the world. This volume brings the history down to the victory of Constantine over Licinius (A.D. 323), and ends with the two celebrated chapters on the causes of the progress of the Christian religion, and the conduct of the Roman government towards the Christians, from Nero to Constantine. Partly perhaps, but certainly not altogether, on account of these chapters, which were perceived to contain a veiled attack on the Christian religion, the book had an immediate and extraordinary success. 'The first impression of one thousand was exhausted in a few days; a second and third edition were scarcely adequate to the demand.'

At the time of the publication of his first volume Gibbon had already been for more than a year a member of Parliament. His parliamentary career, as member first for Liskeard and then for Lympington, lasted almost con-

tinuously from September 1774 till September 1783. Gibbon, intent on his history, gave his silent support to the administration of Lord North, a support for which he was rewarded by a 'commissionership of trade and plantations,' an almost utter sinecure, which, as he says, 'enlarged my private income by a clear addition of between £700 and £800 a year.' When he lost this, Gibbon, perceiving the necessity of making a retrenchment in his expenditure, threw up his seat in Parliament, and decided to seek once more the economical atmosphere of Lausanne. It should be mentioned that he had in the meantime (1781) published two more volumes of the *Decline and Fall*, bringing the work down to the fall of the empire in the West.

In Gibbon's first sojourn at Lausanne he had formed a romantic friendship with a young gentleman of that city named George Deyverdun. The two bachelors now resolved to live together in a convenient mansion, which had been left to Deyverdun by his aunt, and which possessed a garden of four acres, with a fine view over the Lake of Geneva. Here they lived together for six years, till Deyverdun died, on July 4, 1789. The three concluding volumes of the great history were written at Lausanne between 1782 and 1787. With the completion of the *Decline and Fall* the interest in Gibbon's life comes to an end. His *Autobiography* closes in 1789, but he continued to reside at Lausanne till 1793, when, owing to the disturbed state of the Continent, he hastened back to his native land. Seven months after his return he died at his friend Lord Sheffield's house (Jan. 14, 1794).

It is impossible within the limits of this article to give any estimate of the quality of Gibbon's work as a historian, to describe his peculiar, stately, yet allusive style, or to explain the nature of his obligation to Tillemont and other patient students who had in some measure prepared for him his material. It is enough to say that never, except possibly by Ranke, has so vast a historical panorama been painted with so firm a hand, such minuteness of detail where detail was needed, and such large sweeps of the brush where detail would have been out of place. The author had a high ideal of the duties and character of a historian. Even in those painful chapters in which he plays the part of *advocatus diaboli* against the saints and martyrs of Christianity, it would be hard to convict him of literary dishonesty. Actions, as a rule,

are correctly reported by him, if motives are sometimes ungenerously judged. The outline is almost always truly drawn, though the colouring, in the opinion of his Christian readers, does not do justice to the beauty of the original. See Milman's *Life and Correspondence of Gibbon* (1839), and Morison's *Gibbon in English Men of Letters Series* (new ed. 1887).

Gibbons, GRINLING (1648-1720), Dutch wood-carver, born at Rotterdam. He executed carving in the chapel at Windsor, and in the choir of St. Paul's, London. His work is also to be seen at Chatsworth, Petworth, Burleigh, Trinity College (Oxford), and is everywhere distinguished by faithfulness in the imitation of natural objects, and by lightness and grace in style. The bronze statue of James II. at Whitehall and the monument to Newton in Westminster Abbey are examples of his work in statuary. He also carved the wooden archiepiscopal throne in Canterbury Cathedral, and designed the base of the statue of Charles I. at Charing Cross, and of that of Charles II. at the Royal Exchange, London.

Gibbons, JAMES (1834), cardinal, born at Baltimore. Appointed pastor of St. Bridget's, near Baltimore, in 1868, he was consecrated vicar apostolic of North Carolina. He became bishop of Richmond, Virginia (1872), and archbishop of Baltimore, the primate in the United States (1877). He was made a cardinal in 1886. He has published *The Faith of Our Fathers* (about 40 eds.), *Our Christian Heritage* (1889), and *The Ambassador of Christ* (1896).

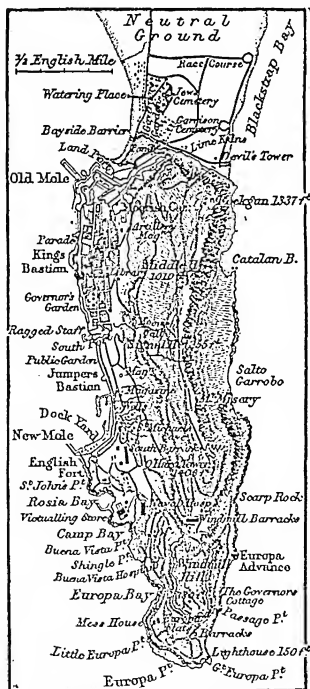
Gibbons, ORLANDO (1583-1625), English musical composer and organist, born in Cambridge. Before 1606 he had made his mark in London as organist of the Chapel Royal—a post he vacated before 1622. Gibbons's madrigals, anthems, hymns are masterpieces of their kind. Historically he is associated with the development of music for stringed instruments, and his fantasias of three parts for viols are admirable examples of the early 17th century chamber music. He lived chiefly in London, but died suddenly at Canterbury, and was buried in Canterbury Cathedral. Gibbons's works have been edited by Sir F. Gore Osuley.

Gibeah, anc. bn., Judah, Palestine, situated to the S.E. of Hebron; also a Benjamite town about 4 m. N. of Jerusalem. The latter place was associated with several notable persons and incidents in the history of Israel (e.g. Judg. 19; 1 Sam. 10:26; 2 Sam. 21:1-14).

Gibeon, a Hivite town in the country of Benjamin, Palestine, N.W. of Jerusalem. It is mentioned on monuments in 965 B.C., when it was captured by Shishak. The Gibeonites came into prominence during Joshua's time. By craft they obtained his promise of friendship (Josh. 9:3-15), but their deception being discovered resulted in their being made "hewers of wood and drawers of water for the congregation" (Josh. 9:16-27). In assisting them against the Amorites, Joshua issued his memorable order, "Sun, stand thou still on Gibeon" (Josh. 10:12). In the days of King David Abner was defeated and Amasa slain (2 Sam. 2:20) at the pool of Gibeon. Solomon sacrificed at Gibeon, and asked and obtained "wisdom" (1 Kings 3:4-15).

Gibraltar, British first-class cruiser (7,700 tons) launched in 1892. The name has been borne by successive ships in the navy since 1711.

Gibraltar (Ar. *Jebel el-Tarik* = 'Mount of Tarik'; called *Calpe* by the Greeks), a bold rocky promontory at the extreme s. point of Spain (N. lat. 36° 6' 30", and W. long. 5° 21' 12"), and a posses-

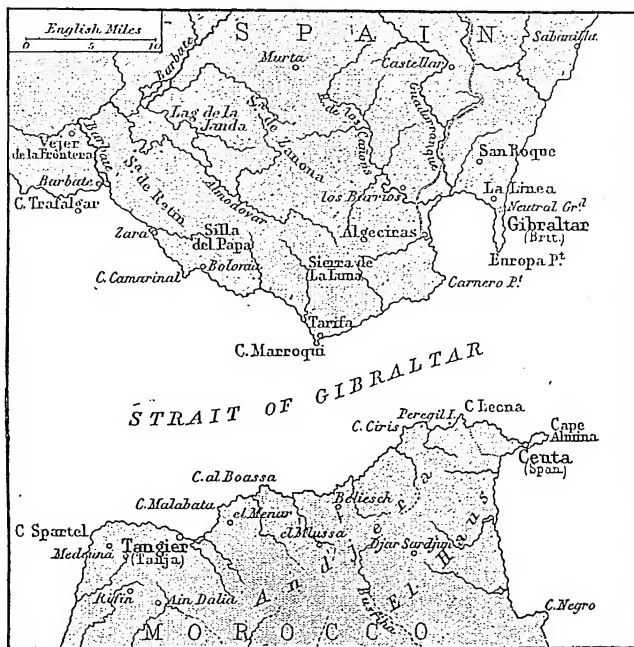


The Rock of Gibraltar.

sion of Britain since its capture by Sir George Rooke on July 24, 1704. The s. extremity has an elevation at the Sugar-loaf Point

of 1,439 ft., the N. extremity being a hundred feet lower. The entire length at the base of the rock is 23 miles, and its greatest

vaded and conquered Spain in 711. It was finally captured by the Spaniards in 1462. After its capture by the British in the



The Strait of Gibraltar.

breadth three-quarters of a mile. The town nestles at the N.W. corner upon a narrow sandy flat. Between 1897 and 1906-8 a new mole and an enclosed harbour (260 ac.) were constructed at the N. end. At the extreme S. point of the rock there are two projecting terraces or cliffs, respectively 300 ft. and 100 ft. high, forming Europa Point, which with Ceuta (Spanish), on the African coast, formed the 'pillars of Hercules' of the ancients.

The town of Gibraltar, which is the see of an Anglican bishop, consists of a main street nearly a mile long; but the site is much crowded by its 20,355 inhabitants (1901), exclusive of its garrison of nearly 6,500 men. Gibraltar being a free port as well as a naval base and coaling-station, is much frequented as a depôt and port of call. The whole of the west, north, and south walls of the rock are pierced by galleries at various levels, and mount in their embrasures a large number of heavy cannon. A curious cinnamon-coloured tailless ape is still found on the sides of the mountain.

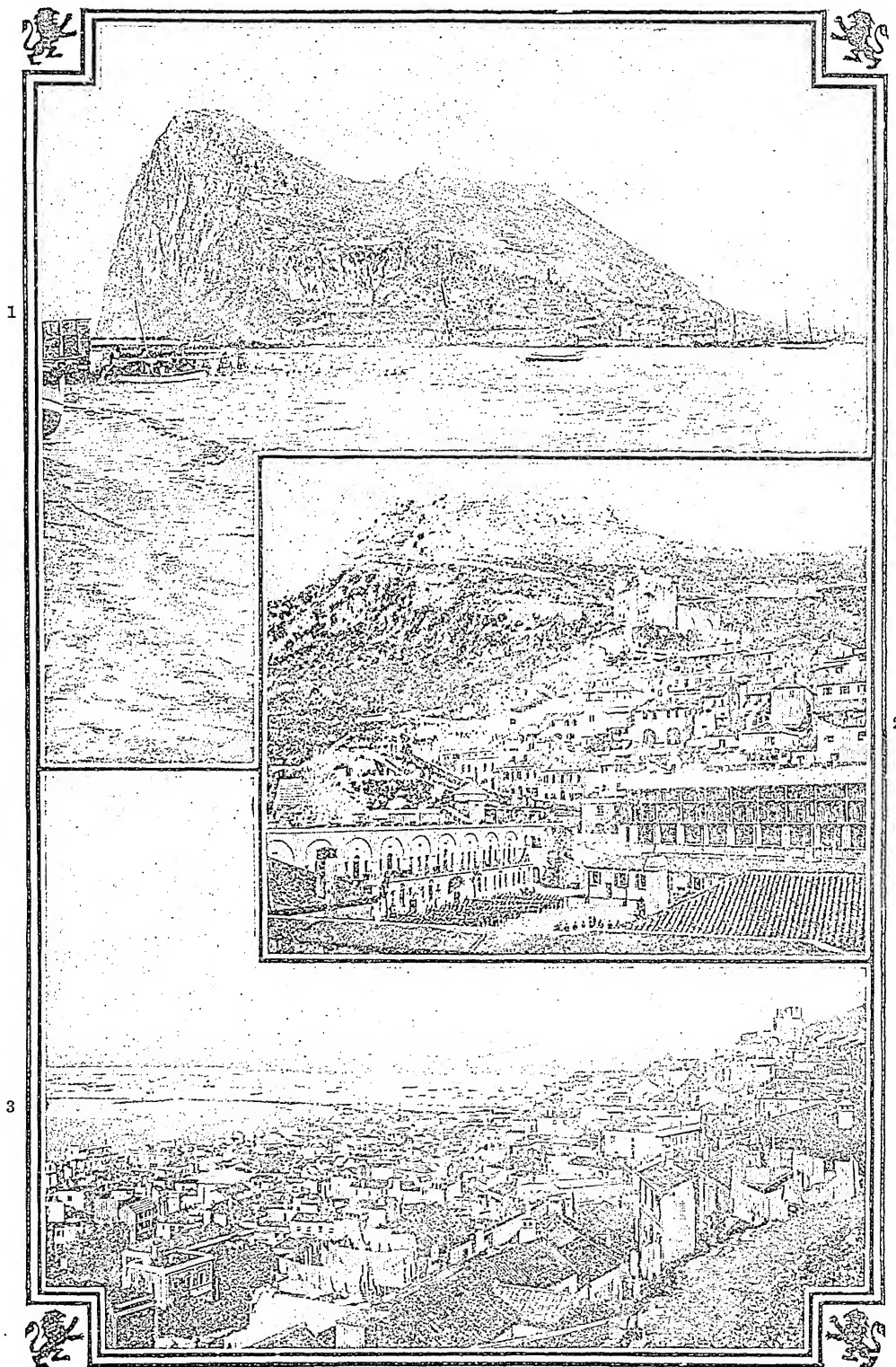
The place was celebrated in the times of the Phoenicians and Greeks, and was fortified by Tarrik, the Berber leader, who in-

war of the Spanish Succession it was repeatedly attacked by the Spaniards, and underwent a long siege in 1726, and from 1779 to 1783, when it withstood the greatest siege in its history, under the gallant Elliott, Lord Heathfield, against the Spaniards and French. See Drinkwater's classic, *The Siege of Gibraltar* (1785).

Gibraltar, STRAIT OF (anc. *Fretum Herculeum*), some 50 m. long, and varying in breadth from $8\frac{1}{2}$ to 23 m., connects the Atlantic Ocean with the Mediterranean Sea.

Gibson, CHARLES DANA (1867), American illustrator, born at Roxbury, Massachusetts. After a visit to Paris (1889), where he studied under Julien, he settled in New York, and devoted himself to black and white drawing. His book illustrations, sketches from places of public resort, and especially his society cartoons, have proved very popular and successful. Among his published works are *London* (1896), *People of Dickens* (1897), *Sketches and Cartoons* (1898), *Americans* (1900), and *The Social Ladder* (1902).

Gibson, JOHN (1790-1866), British sculptor, son of a Welsh market-gardener, born at Gyffin (Conway). He went to London



Views in Gibraltar.

1. General view. 2. Casemate Square. 3. Town and Bay, with fleet at anchor.

(1817), but shortly after settled in Rome, and received instruction from Canova and Thorwaldsen. He was elected A.R.A. in 1833, and R.A. in 1838. His most famous works are *The Hunter and Dog*, *The United Venus* (over which he spent five years, and for four more could not persuade himself to part with his goddess), *Pandora*, *Mars and Cupid*, *Hero and Leander* (now at Chatsworth), besides a group in Westminster Hall, two statues and busts of Queen Victoria, the property of King Edward VII. He died and was buried at Rome. See *Life* by Lady Eastlake (1870).

Gibson, THOMAS MILNER (1806-84), British statesman, born at Port of Spain, Trinidad. After representing Ipswich in Parliament from 1837-9, he resigned on renouncing Conservative for Liberal opinions. After taking a leading part in the Anti-Corn Law agitation, he re-entered the House of Commons as member for Manchester (1841), and as vice-president of the Board of Trade (1846-8) exerted a powerful influence in favour of free trade. His efforts were directed especially against the advertisement duty, the newspaper stamp duty, and the paper duty—abolished in 1853, 1855, and 1861 respectively. After serving as president of the Board of Trade (1859-66) under Lord Palmerston and Lord John Russell, he retired into private life.

Gichtel, JOHANN GEORG (1638-1710), German mystic, was a native of Ratibon (Regensburg). In 1665 he suffered banishment for attacking Lutheran doctrines. His last years were spent at Amsterdam, where he established the sect of *Gichtelianer*, or *Engelsbrüder* (Angelic Brethren), which, spreading over Holland and North Germany, survived into the 19th century. They aimed, by mortification of the flesh, at the establishment of a priesthood 'after the order of Melchisedek,' equal to the angels in purity. Gichtel's *Correspondence* was published by Gottfried Arnold in 1701 and 1708. One of several reprints (under the title *Theosophia Practica*) includes a biography (1722). See *Life* by Reinbeck (1732) and by Harless (1882).

Giddens, GEORGE (1855), English actor, born at Bedford in Middlesex, who appeared first in Edinburgh, and has been closely associated with Sir C. Wyndham. After touring in America, he returned (1878) to join Wyndham at the Criterion, notably in *The Two Roses*, and he also played at the Haymarket, where his Tony Lumpkin made some impression. Later, at the Criterion, he played Blac in *Dandy Dick*,

Dejeneau in *Cyrano de Bergerac*, and O'Hagan, the Irish member, in *The Noble Lord*.

Giddings, JOSHUA REED (1793-1864), American anti-slavery leader, born at Tioga Point, Pennsylvania. Entering Congress from Ohio (1838), he was for twenty-one years a zealous advocate of negro emancipation. At the outbreak of the civil war he became Federal consul-general in Canada, and died at Montreal. Giddings published *The History of the Rebellion: its Authors and Causes* (1864), and *The Exiles of Florida* (1858). See *Life* by Julian (1892) and by Buel (1882).

Gideon, the warrior-judge who delivered Israel from the Midianites. Having been commissioned by a divine visitant to free the nation from the Midianite yoke, Gideon, with a picked force of 300 men, surprised and routed the enemy. By his previous destruction of the Baal altar at Ophrah, which earned him the name of Jerubbaal ('Let Baal plead'), Gideon appears to have been something of a religious reformer, but his fashioning of the ephod after his victory looks like a relapse into idolatry. Critics regard the Gideon narratives as a combination of two separate accounts, not always congruent in their facts. See commentaries on Judges 6-8—e.g. Moore in *International Crit. Com.* (critical), Watson in *Expos. Bible* (homiletical).

Gien, tn., Franco, dep. Loiret, on r. bk. of Loire, 39 m. by rail E.S.E. of Orleans; has faience and china manufactures. Pop. (1901) 7,909.

Giers, NICHOLAS KARLOVITCH DE (1820-95), Russian minister for foreign affairs, born at Radzivilov in Volhynia; became minister plenipotentiary in Persia (1863); then assistant minister under Gortschakov at the Foreign Office (1875). Becoming foreign minister in 1882, he retained the post until the death of Czar Alexander III. (1894)—his policy being the cultivation of close relations with Germany, Austria, and Italy, to the exclusion of France, until that power's advances made its recognition inevitable.

Giesebrecht, FRIEDRICH WILHELM BENJAMIN VON (1814-89), German historian, born at Berlin; became professor of history at Königsberg (1857), and at Munich (1862). Among his works are *De Litterarum Studiis apud Italos Primit Medii Aevi Saeculis* (1845); *Geschichte der deutschen Kaiserzeit*, continued to 1181 (1855-95), his principal book; *Deutsche Reden* (1871); and *Arnold von Brescia* (1873). His translation of Gregory of Tours (1851) is of high merit.

Gieseler, JOHANN KARL LUDWIG (1793-1854), German writer on church history, born at Petershagen (Minden). He became professor of theology at Bonn (1819) and at Göttingen (1831). His chief work is *Lehrbuch der Kirchengeschichte* (1824-57; Eng. trans. 1868), to which a volume of *Dogmengeschichte* was added by Redepenning. Gieseler's early work, *Historisch-kritischer Versuch über die Entstehung und die frühesten Schicksale der Schriftlichen Evangelien* (1818), marked a new departure in the theory of the origin of the gospels. See Biography by Redepenning in the 5th vol. of the *Kirchengeschichte*.

Giessen, tn., Germany, grand-duchy of Hesse-Darmstadt, on the Lahn, 41 m. by rail N. of Frankfurt-on-Main; is the seat of a university (1,100 students in 1904-5), founded in 1607. Its chief features are the new university (1889) and the old castle. Tobacco and cigars, beer, etc., are manufactured, and there are lignite mines. Pop. (1900) 25,491.

Giffen, SIR ROBERT (1837), British statistician, born at Strathaven, Lanarkshire; was sub-editor on the London *Globe* (1862-6); from 1866-8 assisted Mr. Morley on the *Fortnightly Review*; and was assistant editor of the *Economist* (1868-76). Appointed chief of the statistical department, Board of Trade (1876), he was from 1882-97 controller-general of the commercial, labour, and statistical departments. Sir Robert Giffen is the author of *Essays in Finance* (1879 and 1884); *The Progress of the Working-Classes in the Last Half-Century* (1884); *The Growth of Capital* (1890); and *The Case against Bimetallism* (1892); *Economic Inquiries and Studies* (1904).

Gifford, ADAM (1820-87), Scottish judge, born in Edinburgh. Called to the bar (1849), he was a successful advocate, was appointed sheriff of Orkney and Shetland, and in 1870 a judge of the Court of Session, with the title of Lord Gifford.

GIFFORD LECTURES. By his will Lord Gifford left a sum of £80,000 to the universities of Edinburgh (£25,000), Glasgow (£20,000), Aberdeen (£20,000), and St. Andrews (£15,000), for the foundation of lectureships 'for promoting, advancing, teaching, and diffusing the study of natural theology, in the widest sense of that term—in other words, the knowledge of God.' The lecturers chosen were not to be subject to any test whatever; they might be of any or of no particular denomination. The first lecturers were appointed in 1888.

Gifford, WILLIAM (1736-1826), English editor and writer, was born at Ashburton. For some

years he was travelling tutor to the son of his patron, Earl Grosvenor. His verse translation of Juvenal appeared in 1802; but he had already written the *Baviad* (1794) and the *Meviad* (1795), wherein he satirized with slashing ferocity the mawkish nonsense of the Della Cruscans. From November 1797 to July 1798 he edited the *Anti-Jacobin* or *Weekly Examiner*, and was thus associated with Canning, Ellis, and Frere. In 1809 he was appointed first editor of the *Quarterly Review*, and he continued in the editorship till 1824. Gifford's editorial interpolations and omissions caused considerable annoyance to his contributors, notably to Lamb and Southey. In 1805 he had edited the *Works* of Massinger. His edition of *Ben Jonson* followed in 1816, and that of *Pope* in 1827, and his work on *Shirley* was completed by Dyce in 1833. In 1821 he published a verse translation of *Persius*. He was buried in Westminster Abbey. His other publications include the *Epistle to Peter Pindar* (1800), and an *Examination of the Strictures of the Critical Reviewers on the Translation of Juvenal* (1803).

Gift. In order that there may be a valid gift in law, there must be an intention to give, followed by an actual transfer of the property to the donee himself, or to some one to hold in trust for him, unless the donor, as he may do, constitutes himself a trustee. Where a chattel is the subject-matter of the gift, there must be an actual or constructive delivery of it to the donee, unless the gift is made by deed. Many gifts must be in writing to satisfy the Statute of Frauds. See also CONTRACT, DONATIO MORTIS CAUSA.

Gifu, or IMAIZUMI, tn., cap. of ken or prefecture of same name, Nippon, Japan, about 25 m. E. of Lake Biwa. Manufactures of silk and paper. Pop. (1898) 31,942.

Gig, a name applied to (1) a light two-wheeled carriage drawn by one horse; (2) a long, narrow, light rowing boat adapted for speed.

Giga. See JIG.

Gigantes, in ancient Greek legend, the race of giants who sprang from the blood of Uranus, which fell on the earth when he was mutilated by Cronus; hence the earth (Gaea) was their mother. They warred against the gods; but the latter, with the help of Hercules, defeated them, and buried many of them under volcanoes.

Gijón, city, prov. Oviedo, N. Spain (Asturias), 20 m. by rail N.N.E. of Oviedo. It is a prosperous city, and one of the best ports (18 ft. of water) on the

Spanish Biscay coast. In summer it is a popular sea-bathing resort. Gaspar de Jovellanos was a native, and founded the Instituto Asturiano, with its fine art collection. Other features of the town are the Campos Eliseos, a bull ring, a fine 15th-century church, and two palaces. It was the capital of the Asturian princes in the 8th century. Pop. (1900) 47,544.

Gila, riv., U.S.A., 1. bk. branch of the Colorado of the west. It rises in W. New Mexico in two main branches, the Gila proper and Salt River, and flows in a general westerly course to its junction with the Rio Colorado at Yuma. The precipitous cañons of its upper course render the stream unapproachable. Its length is 500 m.; its drainage area is 68,623 sq. m.

Gila Monster, a name given to the poisonous lizards of the genus *Heloderma*. See HELODERMA.

Gilan, or GHILAN, prov. of Persia, bordering the Caspian Sea on s. Area about 6,000 sq. m. From a low, overgrown coast, fertile and well watered, producing rice, peaches, figs, etc., the province rises to the Elburz region. Pop. about 200,000. The capital is Resht, and its port Enzeli.

Gilbert or Kingsmill Islands, in the Pacific, on the equator, between 172° and 177° E., including the islands of Butaritari, Little Makin, Marakei, Apiang, Tarawa, Maiana, etc. Area, 166 sq. m. They are mostly covered with cocoanut palms. Total trade under £50,000, nearly half for copra. They belong to Great Britain. Pop. 35,200.

Gilbert, ALFRED (1854), English sculptor, born in London. Studying under Boehme, under Lanteri at South Kensington, and later at the École des Beaux-Arts, his style exhibits the influence of French 'modernity' and a profound study of Florentine art of the 15th and 16th centuries. His *Perseus Arming Icarus*, at the Royal Academy, was acclaimed for its fine proportions, accurate modelling, and exquisite realism. He was elected A.R.A. in 1887, and R.A. in 1892. His finest works are the *Clarence Memorial* (Windsor), the *Fawcett Memorial* (Westminster Abbey), *Queen Victoria Monument* (Winchester), the *Shaftesbury Fountain* (London), the busts of *George Birdwood* (1892), of *Frank Holl* (Westminster Abbey), *Lord Reay* (Bombay), and the figure of *John Howard* (Bedford).

Gilbert, SIR HUMPHREY (?1539-83), English seaman, was the son of a Devon gentleman, and half-brother to Sir Walter Raleigh. In 1578 he set out to discover and possess unoccupied heathen lands, but came into collision with the Spaniards, lost a vessel,

and returned in 1579, having apparently accomplished little. Gilbert, in 1583, took possession of Newfoundland, suffered several disasters, and, returning with the *Golden Hind* and *Squirrel*, the sole survivors of his flotilla, went down in the former on the night of Sept. 9, 1583.

Gilbert, SIR JOHN (1817-97), English painter and illustrator, born at Blackheath, London. His first exhibited work was a water-colour drawing, *The Arrest of Lord Hastings* (Society of British Artists, 1836); but after this he executed in oil scenes from Shakespeare, Cervantes, and Scott, also historical compositions in both mediums. He then began his celebrated pictures of gypsy life (1845); was elected associate of the Water-colour Society (1852), member (1853), and president (1871). In 1872 he was elected A.R.A., becoming full member in 1876. As an illustrator he contributed to the *Illustrated London News*, the *London Journal*, and illustrated many of the British classics. His compositions are vigorous and fresh, dramatic and romantic in treatment, his figures being finely grouped. Among his notable easel pictures are *The Convocation of the Clergy* (1872), *Diploma Gallery*; and *Richard II. resigning the Crown* (1876), at Liverpool. In 1893 he presented to the nation a collection of his works, which were divided among London, Birmingham, Liverpool, and Manchester.

Gilbert, SIR JOHN THOMAS (1829-98), Irish antiquary and historian, born in Dublin; wrote (1854-9) a *History of Dublin*. He was librarian of the Royal Irish Academy (1855-89). In 1863 his articles led to the establishment of the Public Record Office at Dublin. Gilbert published further *Historical Essays on Ireland* (1851), and *Contemporary History of Affairs in Ireland, 1641-52* (1879-80); *Documents relating to Ireland* (1893); *Crede Mihi, the Register of the Archbishops of Dublin before the Reformation, A.D. 1275* (1897). He also edited the Dublin civic records as far as the year 1730. See *Life* by Lady Gilbert (1905).

Gilbert, SIR JOSEPH HENRY (1817-1901), English chemist, was born at Hull; and in 1843, with his fellow-student, Lawes (afterwards Sir J. B. Lawes of Rothamsted), entered upon fifty-seven years' research in agricultural chemistry and vegetable physiology. For Liebig's 'mineral theory' they substituted the 'nitrogen theory,' thereby revolutionizing scientific farming. An account of their experiments will be found in *Agricultural Investigations at Rothamsted* (1895).

Gilbert, St. (c. 1083-1189), born at Sempringham, Lincolnshire; was presented with the livings of Sempringham and Tirington. He led an austere and religious life, and in 1148 founded the order of the Gilbertines. His day is January 11.

Gilbert, WILLIAM (1540-1603), English physician, born at Colchester, Essex. Settling as a physician in London, he became president of the College of Physicians (1600), and court physician to Elizabeth and James I. In 1600 appeared his *De Magnete, Magneticisque Corporibus*, etc. (Eng. trans., with biography, by Motteley, 1893), in which he laid down theories on terrestrial magnetism and electricity, now established as correct. He invented the terms 'electric force' and 'electricity.' His *De Mundo nostro Sublunari Philosophia Nova* was published at Amsterdam in 1631.

Gilbert, WILLIAM (1804-90), English author, born at Bishopstoke, Hampshire. He resided in Italy, and wrote several poems, thereafter studying medicine and serving as surgeon in the navy. Retiring under sixty years of age, he turned author and novelist. Wrote many novels treating of social questions; also *Lucretia Borgia*, a Biography (1869); *The City Corporations and Livery Companies* (1877); *Memoirs of a Cynic* (1880).

Gilbert, WILLIAM SCHWENCK (1836), English dramatist, is a Londoner by birth. His first play, *Dulcamara*, was produced in 1866; and in 1869 and 1873 he published the humorous *Bab Ballads*. Two whimsical plays, *The Palace of Truth* and *The Wicked World*, appeared in 1870 and 1873 respectively. His comedies and prose plays include *Pygmalion and Galatea* (1871); *Broken Hearts* (1875); *Tom Cobb* (1875); *Dan'l Druce* (1876); *Engaged* (1877); *The Ne'er-do-weel* (1878); *Gretchen* (1879); *Foggerty's Fairy* (1881); *Comedy and Tragedy* (1884); *Brantingham Hall* (1888); *Harlequin and the Fairy's Dilemma* (1904). In 1871 his collaboration with Sir Arthur Sullivan, which lasted until 1896, began with *Thespis*, and continued with *Trial by Jury* (1875), *The Sorcerer* (1877), *H.M.S. Pinafore* (1878), *The Pirates of Penzance* (1880), and *Patience* (1881); to be followed by the famous 'Savoy' series of comic operas, *Iolanthe* (1882), *Princess Ida* (1884), *The Mikado* (1885), *Ruddigore* (1887), *The Yeomen of the Guard* (1888), *The Gondoliers* (1889), *Utopia* (1893), *The Grand Duke* (1896). Besides these, he has written, to the music of other composers, *The Mountebanks* (1892) and *His Excellency* (1894). His humour in these librettos,

delightfully irresponsible, and securing much of its effect by a mock-serious treatment of the most incongruous situations, is of a unique quality. Besides this, his ability as a versifier is unsurpassed, and his writing of lyrics marked by the greatest literary care and a very graceful fancy. His *Original Plays* were published in collected form in 1886-95, and his *Original Comic Operas* in 1890.

Gilbert Blane Medals, gold medals awarded every alternate year to the two naval medical officers who produce the most approved journals of their practice while in medical charge of a ship of war. The provision was founded in 1830 by Sir Gilbert Blane (1749-1834).

Gilbertines, THE, a monastic congregation of men and women, founded in 1148 by St. Gilbert. The rule for the men was founded on that of the canons regular, and the women's rule on that of St. Benedict. At Gilbert's death there were thirteen houses, and twenty-five were suppressed at the dissolution of the monasteries. See R. Graham's *St. Gilbert of Sempringham and the Gilbertines* (1901).

Gilbey, SIR WALTER (1831), born at Bishop Stortford, Herts, founder of the firm of W. and A. Gilbey, wine merchants. For thirty years he has laboured to improve the breeds of English horses; has written extensively on this subject, notably his *History of the Great Horse or War Horse* (1888); *The Harness Horse* (1898); *Pontes, Past and Present* (1900); *Horse-Breeding in England and India* (1901); *Horses, Past and Present* (1900); *Animal Painters in England from 1650* (1900); *Horses for the Army—a Suggestion* (1902); *Early Carriages and Roads* (1903); *Modern Carriages* (1904).

Gilboa, mountain (1 Sam. 31:1) on the great plain of Esdraelon, Palestine. It was the scene of Saul's last battle, and is celebrated in David's lament for Jonathan.

Gilchrist, ALEXANDER (1828-61), English art biographer, was born at Newington Green, London. His *Life of Etty* (1855) brought him the friendship of Carlyle. In 1857 he began his *Life of Blake*, a masterpiece of careful biography, which was almost finished when the author died. See Memoir by his wife, prefixed to the second edition of the *Life of Blake* (1880).

Gilchrist, ANNE (1828-85), English miscellaneous writer, wife of the preceding, completed his *Life of Blake* (1863). She published a *Life of Mary Lamb* (1883), and a *Confession of Faith* (1885). See *Anne Gilchrist, her Life and Writings*, by her son (1887).

Gilchrist, JOHN BORTHWICK (1759-1841), Scottish Orientalist, born at Edinburgh; was surgeon under the East India Company (1794), and principal of Fort William College, Calcutta (1800-4). He bequeathed the Gilchrist Education Trust fund 'for the benefit, advancement, and propagation of learning in every part of the world.' Scholarships are awarded on competitive examination, grants are made to educational institutions, and scientific lectures are delivered at a charge of one penny for admission.

Gild, or **GUILD**. Various explanations are given of the origin of the 'gild,' which was a mediæval voluntary association for mutual aid and assistance. Some writers connect it with the Roman *collegia*, and traces enough exist of some sort of survival among the Roman cities of the south of France to render the theory plausible; many German writers trace the origin to the early Germanic drinking bouts. The gilds do not owe their origin to the church, although down to the 12th century they were mainly religious in character, many remaining so till they were suppressed in 1547, at the reformation in England. The gild was, however, industrial or commercial in scope. The gild proper consisted of two entirely distinct bodies—the 'gild merchant' and the 'craft gilds.' The gild merchant was the earlier to appear. The chief privilege was that the member of such a gild had within its jurisdiction the monopoly always of retail trade. There was in England no struggle between the craft and merchant gilds. The belief that the gild merchant became the municipal government is, in the case of England, not borne out by facts. In Scotland, on the other hand, in the 15th and early 16th centuries, there was a keen struggle between the two bodies; and on the Continent a similar struggle for supremacy was in most of the 'free cities' embittered by efforts to secure democratic government. The craft gilds from the 14th century usurp attention. Their object was the regulation of the trade in the interests of the workers. Many of their regulations were intended to secure honest work. But the spirit of monopoly exercised its baneful influence. The confiscation of their religious funds at the reformation did not really affect them much; they had already begun to decay, and, as union declined, to hamper and hinder trade. Out of the decaying craft gilds there grew two sets of institutions—journeymen's gilds, in which it is claimed that the modern trades union has its origin; and

the companies of capitalist employers, which survived the decay of the gild system, and became in London the Livery Companies. See Gross's *Gilda Mercatoria* (1883; with bibliography, 1890); Welord's *Gilds, their Origin, Constitution, etc.* (2nd ed. 1888); Brentano's *History and Development of Gilds*, contained in Smith's *English Gilds, their Statutes and Customs* (1870); Lambert's *Two Thousand Years of Gild Life* (1892); Mrs. Green's *Town Life in 14th Century* (1894); and St. Martin's *Histoire des Corporations de Métiers* (1897).

Gildas, or **GLDUS** (516-570), English historian, surnamed 'Sapiens' and also 'Badonicus,' from one of the battles between the Saxons and Britons. His *De Excidio Britannie* (first printed by Polydore Vergil in 1525; first English version by Habington in 1638) is the sole authority for our history during the 5th century.

Gilder, **RICHARD WATSON** (1844), American editor and poet, born at Bordentown, New Jersey. He was managing editor and editor-in-chief of *Scribner's* and of the *Century Magazine*; is author of *Lyrics*, *The Great Remembrance*, *The Celestial Passion*, *Two Worlds* (all four together in *Five Books of Song*, 1894), *Poems and Inscriptions* (1901), *A Christmas Wreath* (1903), *In the Heights* (1905); and has published (1901) *Letters and Speeches of A. Lincoln*.

Gilder, **WILLIAM HENRY** (1838-1900), American Arctic explorer, born at Philadelphia; was engaged in journalism from 1871 to 1884, latterly in connection with the *New York Herald*. In 1878 he accompanied Schwatka in his search for Sir John Franklin, and participated in the search for the De Long expedition (1881). He published *Schwatka's Search* (1881) and *Ice Pack and Tundra* (1883).

Gildersleeve, **BASIL LANNEAU** (1831), born at Charleston, S. Carolina; became professor of Greek (1856-76) and of Latin (1861-8) in University of Virginia. He was then called (1876) to Baltimore as first Greek professor at the newly-founded Johns Hopkins University; has been editor of the *American Journal of Philology* from 1880; is author of *Latin Grammar* (1867, 1894, 1899), *Syntax of Classical Greek* (1900), *Essays and Studies* (1890), and editions of Persius (1875), Justyn Martyr (1877), and Pindar (1885).

Gilding, or the art of covering baser materials with gold, was practised by the Hebrews, Egyptians, Romans, and others. Modern methods of gilding may be classified under three heads: (a) those in which thin leaves of gold are attached by means

of suitable adhesives; (b) the application of finely-divided pulverulent metal instead of leaf; and (c) chemical or electro-chemical processes. Typical leaf-gilding processes are those of the picture-frame maker and bookbinder; while the use of powdered gold enters largely into the decoration of pottery, porcelain, etc. In electro-gilding or gild-plating, the gold is deposited by an electric current obtained from thermopile, dynamo, or, most commonly, a battery. The articles to be gilded are first thoroughly freed from grease by immersion in a boiling solution of potash, and any oxide or rust removed from their surfaces. To this end, brass, German silver, or copper articles are immersed in strong acids and afterwards washed. Articles of Britannia metal, lead, tin, zinc, or pewter require a preliminary coating of copper or brass before immersion in the solution of gold. The latter may be prepared in two ways—(1) by passing a current through a hot solution of potassium cyanide (1 lb. to the gallon of distilled water), the electrodes consisting of sheets of gold suspended by platinum wires; or (2) by dissolving 1 oz. of cyanide of gold and 4 oz. of cyanide of potassium in 1 gallon of distilled water. The first process must be continued until about an ounce of gold has been dissolved by the cyanide. This can be readily ascertained by weighing the anode and cathode. In this solution the articles are suspended by means of platinum wires, or, if small, are placed in a perforated stoneware receptacle. They are then connected with the negative pole of the battery. The anode consists of a gold plate, which must be equal to or larger than the surface of the articles; and the plating solution is kept at a temperature of 90°-130° F. with frequent agitation. When a sufficient thickness of deposit is obtained, the articles are well washed in water, and dried by immersion in hot boxwood sawdust.

Gilead, or **MOUNT GILEAD**, a region of Palestine E. of the Jordan, roughly bounded by the river Yarmak (Hieromax) on the N., and a line passing through the N. end of the Dead Sea on the S., though it seems to have included also the tribal territory of Gad (Deut. 3: 13). Gilead is a land of great beauty and fertility. The principal cities were Mahanaim, Succoth, Penuel, Mizpeh, Jazer, Jabesh-gilead, and Ramoth-gilead; here, too, were the later Pella and Gerasa. Jephthah and Elijah belonged to Gilead. See Laurence Oliphant's *The Land of Gilead* (1880); also **BALM OF GILEAD**.

Giles, **ERNEST** (1839-97), Australian explorer. Born at Bristol, England, he went early to Melbourne. In 1874-6 he succeeded in crossing with camels from Adelaide to Perth about the parallel of 30° S. lat.; he returned eastwards, and again crossed the country between the 24° and 25° parallels. These and his other expeditions led to the discovery of Lake Amadeus, Queen Victoria Springs, etc., and bore out the belief that the interior west of 132° E. long. is waste scrub and waterless desert. He wrote *Geographic Travels in Central Australia* (1875), *The Journal of a Forgotten Expedition* (1880), and *Australia Twice Traversed* (1889).

Giles, **HERBERT ALLEN** (1845), English Chinese scholar, was in the consular service in China (1867-93). He is the author of *Chinese without a Teacher* (1872; 5th ed. 1900); *Buddhist Kingdoms* (1877); *Historic China* (1882); *History of Chinese Literature* (1901); *Glossary of Reference on Subjects connected with the Far East* (1878; 3rd ed. 1900); *Gems of Chinese Literature* (1884); *The Remains of Lao Tzu* (1886); *A Chinese Biographical Dictionary* (1897); *China and the Chinese* (1902); *Introduction to the History of Chinese Art* (1903); *Confucianism in the 19th Century* (1901); *Religions of Ancient China* (1905); and of Chinese dictionaries. He was appointed lecturer on Chinese in Columbia University, New York (1902).

Giles, **St.** (Lat. *Egidius*), probably lived in the end of the 7th century. In the 11th and 12th centuries the worship of St. Giles, who was the patron of lepers, cripples, and beggars, spread very widely. His day is September 1. See Rembry's *St. Gilles, sa Vie*, etc. (1884).

Gilfillan, **GEORGE** (1813-78), Scottish essayist, born at Comrie, Perthshire. In 1836 he became pastor of a Secession congregation at Dundee, and was its minister until his death. Gilfillan was possessed of a vigorous style and great though ill-restrained powers of imagination. Among his works may be mentioned *Gallery of Literary Portraits* (three series, 1845, 1850, and 1854); *Bards of the Bible* (1851); *Lives of Burns* (1856, 1879) and *Scott* (1870); *History of a Man* (1856). He achieved a great reputation as a lecturer and preacher. See *Letters and Journals*, with Memoir by Watson (1892).

Gilfillan, **ROBERT** (1798-1850), Scottish poet, born at Dunfermline. His best-known works are the charming songs *Fare thee well*; *Why left I my home?* and a satire, *Peter M'Craw*.

Gilgal, the name of three places in Palestine, of which the most famous (Josh. 4:19, etc.) was 3 m. E. of Jericho, in the Jordan valley. Another Gilgal was in Mount Ephraim (2 Kings 2:1), north of Bethel. A third, called Gilgal of the Gaim or 'nations' (Josh. 12:23), was in Sharon, south-east of Caesarea. The Samaritans recognized a fourth Gilgal, near Shechem. Gilgal near Jericho was a sacred site in Samuel's time, and the scene of Saul's election as king over the Israelites (1 Sam. 11:15). It afterwards became an idolatrous centre (Hos. 9:15, etc.).

Gilgit, or GILGIT, a district of N.W. Kashmir; since 1889 a British agency. Included in it are the valleys of Chitral, Gilgit, and the Indus (part), Hunza, Swat, Ladakh, etc. Total area, between 20,000 and 30,000 sq. m. The town is situated about twenty miles from the Indus.

Gilia, a genus of hardy American plants belonging to the order Polemoniaceae. Their flowers are of various colours, and have infundibuliform corollas. They like a light soil and an open situation, and are easily grown from seed.

Gili, or GILLI, FILIPE SALVATORE (1721-89), Italian Jesuit missionary, born at Legano, near Spoletto, in the Papal States; embarked for S. America about 1740. For eighteen years he traversed the vast region watered by the Orinoco, and afterwards resided seven more at Santa Fé de Bogotá. On his return home he wrote *Saggio di Storia Americana* (1780-4).

Gill, a measure for liquids, containing one-fourth of a standard pint. Until about 1825 there was some want of uniformity in the use of the name. In the north of England and in parts of Scotland a half-pint was called a gill.

Gill, SIR DAVID (1843), astronomer-royal at the Cape of Good Hope, born at Blairyth, Aberdeenshire, Scotland. He gained experience (1873-6) as head of the private observatory of Lord Lindsay (now Earl of Crawford) at Dunch in Aberdeenshire. In connection with Lord Lindsay's expedition to the Mauritius for astronomical purposes, he carried out the chronometric determinations of longitude connecting Berlin, Malta, Suez, Aden, Réunion, Mauritius, and other points. In 1877 he, at the Khedive's request, measured near Cairo the base-line of the Egyptian geodetic survey; he (1885) began the geodetic survey of Natal and Cape Colony (completed 1896), and organized that of Rhodesia (1897). He has published *Determination of the Solar Parallax from Observations*

of Mars at Ascension in 1877, and *Heliometer Determinations of Stellar Parallax in Southern Hemisphere*, in 'Memoirs' of Royal Astronomical Society, vols. xli. and xlviii.; *The Cape Photographic Durchmusterung* (1885-90); *Determination of the Solar Parallax and Mass of the Moon from Heliometer Observations of Victoria and Sappho*, in 'Annals' of the Cape Observatory; *Catalogues of Stars for the Equinoxes 1850, 1860, 1885, 1890*. He has also issued two volumes on the *Geodetic Survey of South Africa*.

Gill, JOHN (1697-1771), English Baptist divine, born at Kettering, Northamptonshire. From 1719 till his death he was pastor of a Baptist congregation at Horsleydown, Southwark, London. His chief works are *Exposition of the Holy Scriptures* (9 vols. 1746-1766), *The Cause of God and Truth* (4 vols. 1735-8), and *Antiquity of the Hebrew Language* (1767). See *Memoir* by Dr. Ripon (1816).

Gillenia, a genus of American plants belonging to the order Rosaceae. The best-known species is *G. trifoliata*, which bears panicles of white or pink flowers, terminal on long flower-stalks. It is a hardy herbaceous plant, easily grown in a slightly shady situation, in peaty soil.

Gillespie, GEORGE (1613-48), Scottish Presbyterian divine, was born at Kirkcaldy, Fifeshire, and was appointed (1638) minister of Wemyss, Fifeshire. In 1643 he was one of the commissioners sent by the Scottish Church to the Westminster Assembly. In 1646 he published a remarkable work on church government, entitled *Aaron's Rod Blossoming*. He was elected moderator of the General Assembly of the Church of Scotland in 1648. See *Memoir* by Hetherington, prefixed to his *Works* (1843-6).

Gillespie, THOMAS (1708-74), founder of the Relief Church, born at Clearburn in Duddingston, near Edinburgh; was admitted to the parish of Carnock, near Dunfermline (1741). In 1752 Gillespie vigorously opposed the induction of Andrew Richardson to the parish of Inverkeithing, near Dunfermline, against the mind of the parishioners, and was himself deposed from the ministry by the General Assembly. After nine years of independent preaching, the Relief Church was founded by him (1761). Gillespie laboured at Dunfermline until his death. In 1847 the Relief Church united with the Secession Church of 1733, forming the United Presbyterian Church. See Struthers's *History of the Relief Church* (1839); W. Lindsay's *Life of Thomas Gillespie* (1849).

Gillette, WILLIAM HOOKER (1855), American actor and dramatist, is a native of Hartford, Connecticut. He has been on the stage since 1877, is an accomplished actor, and the author of several well-written plays. These include *The Professor*, *Esmeralda* (both produced in New York, 1881), *Held by the Enemy* (in London, 1887), *Secret Service* (in London, 1897), *Sherlock Holmes* (in London, 1901).

Gillies, DUNCAN (1834-1903), Australian statesman, was born at Glasgow, and went when a young man to the gold fields of Ballarat in Victoria; was a member of the Victorian Parliament from 1859 to 1894; and was successively president of the Board of Lands Surveys (1868-72, 1875-77), commissioner of railways (1872-5, 1880, 1883-6), premier and treasurer (1886-90), and agent-general for Victoria in London (1894-6). In 1890 he was chairman of the Federal Conference held at Melbourne.

Gillies, JOHN (1747-1836), Scottish historian and classical scholar, was born at Brechin in Forfarshire; travelled as tutor to the sons of the second Earl of Hopetoun, issuing also a translation of the *Orations of Lysias and Isocrates* (1778). In 1786 he published *The History of Greece*, his most popular work, now long superseded; and in 1793 he succeeded Dr. Robertson as royal historiographer of Scotland. His only other works of note were *View of the Reign of Frederick II. of Prussia* (1789), and *A History of the World* (1807).

Gilliesia, a genus of liliaceous, bulbous plants, bearing umbels of interesting greenish-coloured flowers. A warm, sheltered position and a light, peaty soil are required for their culture in Britain. *G. graminca* is the best known species.

Gilliflower, a term which has been applied to a number of different plants, such as the carnation and pink. The name is often wrongly supposed to be a corruption of July-flower.

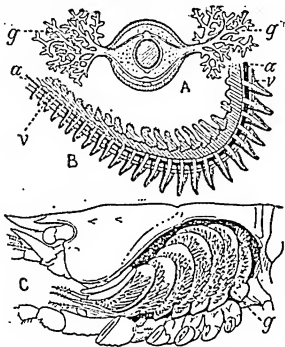
Gillingham. (1.) Municipal bor. (incorporated 1903), Kent, on Medway, E. of and adjacent to Chatham, a small part of which, with Old and New Brompton, is included in the borough. Industries include an extensive torpedo factory and brick and cement works. Pop. of par. (1901) 42,530. (2.) Market town, 4 m. N.W. of Shaftesbury, Dorset, England. Pop. (1901) 3,380.

Gillis Land, territory, Arctic regions, about 81° N., and between 36° and 42° E.; first sighted by Gillis in 1707.

Gillott, JOSEPH (1799-1873), English penmaker, born at Sheffield. Migrating to Birmingham

(1821), he turned his attention (1830) to new mechanical processes for the manufacture of steel pens. He established large works (1839) and amassed a great fortune.

Gillray, JAMES (1757-1815), English caricaturist, was born at Chelsea. Turning to caricature, his first success was a series illustrating Rodney's victory over De Grasse off Guadeloupe (1782). His known caricatures exceed 1,500. George III. and the court were frequent butts of his sometimes genial but often savage pictorial satire. See Wright's *Works of Gillray, with . . . Life* (new ed. by Grego, 1873).



Gills.

A. Transverse section of a worm (*Trenicola*) with external gills. B. Branchial arch of perch; a, artery; v, vein. C. Thorax of crayfish, portion of carapace removed to show gills, g.

Gills, or **BRANCHIÆ**, the breathing organs of aquatic animals, vary infinitely in structure, from the simple 'skin-gills'—mere pouches of the skin—of some echinoderms to the elaborate organs of fish. Gills tend either to be arborescent organs, or to consist of a series of thin plates, both modifications serving to increase the respiratory surface. There is in very many cases some arrangement whereby the organs are protected from injury, while still fully exposed to the action of the water. Examples are the gill covers of the higher Crustacea and of the bony fish. In invertebrates the gills are simply outgrowths of the body wall, as are also the external gills of certain vertebrates—e.g. young amphibians, young elasmobranchs, and so on. The internal gills of the aquatic vertebrates, on the other hand, arise in connection with the gill clefts, which are perforations of the wall of the alimentary canal, and are associated with supporting bars, the gill arches. Vertebrates above amphibians never have internal gills at any period of life; but gill clefts and gill arches are present, at least in early life, although gills are not, and the

jaws arise from the modified anterior gill arches. In the lowest vertebrates (i.e. in Amphioxus and the cyclostomes) structures representing gill clefts are present, but not gills. In the vertebrate series, therefore, breathing by gill clefts precedes breathing by gills, which is a specialized derivative of the former method. In invertebrates the less specialized forms breathe by the whole surface of the skin. In the chætopods all stages may be observed.

Gilly, mining tn., Belgium, prov. Hainault, 2 m. N.E. of Charleroi. Pop. (1900) 22,604.

Gilman, DANIEL COIT (1831), American educationist, born at Norwich, Connecticut. Appointed professor of geography at Yale in 1856, he soon distinguished himself as an authority on higher education, being successively superintendent of schools at New Haven, State School superintendent of Connecticut, and in 1872 president of the University of California. Having helped to organize the Johns Hopkins University, Baltimore, he became its first president (1875)—an office which he held until 1902. In 1902 he was chosen president of the Carnegie Institute at Washington. He served on the Venezuela Boundary Commission (1896). His best-known works are *University Problems* (1898); the *Life of James Dwight Dana* (1899), and the *Life of President Monroe* (1883; 2nd ed. 1898); *Science and Letters in Yale* (1901). He was chief editor of the *New International Encyclopedia* (1901-3).

Gilolo. See JILOLO.

Gilpin, BERNARD (1517-83), the 'Apostle of the North,' was born at Kentmere, Westmorland. He was appointed rector of the large parish of Houghton-le-Spring, Durham, where he became famous for his benevolence and his self-sacrifice; while he built and endowed a large grammar school, and educated many children at his own expense. Much of his time was spent in remote and neglected parts of Northumberland and Yorkshire, preaching and assisting those who were in want. See *Life* by Carleton (1629; 1852); also Collingwood's *Memoirs of Bernard Gilpin* (1884).

Gilpin, WILLIAM (1724-1804), born at Scaleby Castle, Cumberland. For thirty years he conducted a school at Cheam in Surrey, spending his vacations in 'picturesque tours' through England and Wales. These journeys he described in five volumes (1778, etc.), illustrated by his own aquatint sketches, the somewhat florid style of which inspired Combe's satire of *Dr. Syntax*. Gilpin also left biographies of the

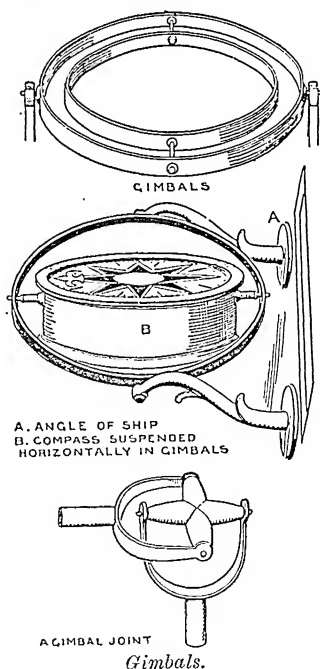
English reformers, and works of a religious character.

Gilt-head (*Chrysophrys aurata*), a fish belonging to the family of the sea-brems (Sparidae), which is common in the Mediterranean, and occasionally occurs off the south coast of England. The fish is furnished with strong teeth, by means of which it breaks up the shells of the mussels on which it chiefly feeds. It was a favourite with the ancients, and was kept by the Romans in their *vivaria*.

Gil Vicente. See VICENTE.

Gilyaks, a small Tungus tribe occupying the northern part of the island of Sakhalin and the valley of the Lower Amur to the Sea of Okhotsk. They live by fishing and hunting. They are pagans.

Gil y Zárate, ANTONIO (1793-1861), Spanish dramatic author, spent most of his life as an official in the ministry of the interior. His works being liberal and anti-clerical in tendency, and dealing boldly with the lives of historical personages, caused much controversy, but enjoyed great popularity. Gil's best-known plays are *El Entrometido*, *Cuidado con las Novias*, *Don Alvaro*, *Blanca de Borbon*, and *Carlos II. el Hechizado* (1837). A collection of his *Obras Dramaticas* appeared in 1850.

A. ANGLE OF SHIP
B. COMPASS SUSPENDED
HORIZONTALLY IN GIMBALS

A GIMBAL JOINT

Gimbals.

Gimbals, a contrivance designed to keep a marine compass, chronometer, lamp, or other instrument in the horizontal posi-

tion on board ship, notwithstanding the rolling and pitching of the vessel. The instrument is suspended in the diametral axis of a ring, which is again suspended in the diametral axis of another ring, the two axes being at right angles to one another.

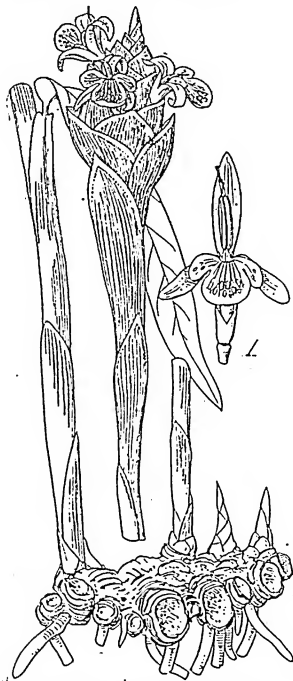
Gimp, a flat trimming made of silk, worsted, or other cord, usually stiffened by wire, and more or less open in design. Military gimps are made of gold and silver.

Gin, or **GENEVA**, an ardent spirit produced from malted and fermented liquor by distillation. In preparing the best qualities, special attention is given to rendering the spirit neutral. This can generally be attained by the addition of alkaline salts and re-distilling. The essential oils of juniper and certain other plants are then added, the treated spirit is again distilled, and is then placed in cool stores to mature. It should be free from cloudiness when brought into water, and possess a fine delicate flavour. Its alcoholic strength varies from 40 to 52 per cent. Sweetened gin, or Old Tom, is a London beverage, obtained by dissolving the right proportions of sugar in a small quantity of water, and adding to the ordinary spirit. Hollands gin, Schiedam, or schnapps is a variety manufactured near Schiedam in Holland from mixed barley, malt, and rye. Aalborg (Denmark) schnapps is another variety of gin.

Gindely, **ANTON** (1829-92), Czech historian, born and died at Prague. He was successively professor of history at Olmütz (1853-5) and Prague. He made an exhaustive study of the period of the 'Thirty Years' war, and published *Geschichte des Dreissigjährigen Kriegs* (1869-80). His other works include *Geschichte der Böhmisches Brüder* (1856-7); *Rudolf II. und seine Zeit* (1862-5); *Waldstein während seines ersten Generalats* (1886); *Ueber des J. A. Comenius Leben und Wirksamkeit* (2nd ed. 1893); and *Geschichte der Gegenreformation in Böhmen* (1894). He also edited *Monumenta Historie Bohemica* (1864-7) and *Böhmischen Landtagsakten seit 1526* (1877-92).

Ginger, the dried rhizome of the tropical plant *Zingiber officinale*. It is used in cookery, because of its aromatic volatile oil. In medicine it is employed as a carminative, usually in the form of the tincture. It is grown principally in the East Indies (its original home), the West Indies, and tropical Africa. When candied it makes a delicious sweetmeat. 'Preserved ginger' is the young root-stocks preserved in syrup.

Ginger Beer, a weak alcoholic effervescing beverage of a refreshing character, prepared by pouring boiling water over crushed ginger root; filtering, adding lump sugar, cream of tartar, and yeast. Fermentation ensues, and when nearly complete the liquor is transferred to a fresh cask, and ultimately into strong earthenware bottles. It contains less than two per cent. of alcohol. **GINGER ALE** is an effervescing drink somewhat similar to ginger beer. **GINGER WINE** is a name given to a variety of products, some of which are closely related to ginger beer, while others are of a syrupy nature. The alcoholic strength varies greatly, as it is prepared either with or without the aid of fermentation.



Ginger, showing rhizome.

1. Flower.

Gingham, cotton dress goods woven of variously coloured threads, generally in some checked or striped pattern. Manchester and Glasgow are now the chief seats of the industry.

Ginkgo, a one-species genus of deciduous coniferous plants. *G. biloba*, the maidenhair tree, is a Chinese plant which is hardy in the south of England. The large, yellow, plumlike fruit is edible; but it is for the beauty of its foliage that the tree is cultivated in Britain. The Japanese plant it round their temples.

Ginguené, **PIERRE LOUIS** (1748-1816), French literary historian, born at Rennes (Brittany). He first attracted attention by his poem, *Confession de Zulmé* (1779). He advocated the principles of the revolution in the periodical *Feuille Villagoise*. Thrown into prison on account of his moderate views, he was liberated after Robespierre's death. He produced the *Histoire Littéraire d'Italie* (1811-24), his chief work, which, in spite of some inaccuracies, is an important authority on the subject. Ginguené also took a leading part in the preparation of a history of French literature from the 12th century. See *Notice sur la Vie et les Ouvrages de P. L. Ginguené*, by Pineux Duval (1817).

Ginkel, or **GINCKEL**, **GODART DE**. See **ATHLONE**, **EARL OF**.

Ginsburg, **CHRISTIAN DAVID** (1831), rabbinical scholar, born in Warsaw. His verdict on the Shapira manuscript decided the British Museum against its purchase, and led to the discovery of the fraud. His chief works are *The Massorah* (4 vols. 1880-1906); *Critical and Historical Commentaries on the Song of Songs, Ecclesiastes* (1887), and *Leviticus* (1882); historical accounts of the *Karaites* (1862) and the *Essenes* (1864); *The Kabbalah* (1865); *The Moabite Stone* (1871); and the important *Critical Text of the Hebrew Bible* (1894), and *Introduction of the Hebrew Bible* (1896). Dr. Ginsburg was one of the original members for the revision of the Old Testament.

Ginseng (*Panax quinquefolium*, or *Aralia quinquefolia*), a hardy herbaceous plant, native of N. America. It has palmately dissected leaves and yellowish flowers. Its root is much used by the Chinese as a stimulant, aromatic, medicinal herb.

Ginungagap. See **MYTHOLOGY** (Northern).

Gioberti, **VINCENZO** (1801-52), Italian philosopher and politician, a native of Turin. Appointed court chaplain (1831) by Charles Albert of Sardinia, Gioberti through his liberal views incurred the enmity of the Jesuits, who brought about his banishment (1834). During his exile, spent partly in Paris, but chiefly in Brussels, he wrote *Teoria del Sovran naturale* (1838); *Introduzione allo Studio della Filosofia* (1839), his most important work; *Del Bello* (1841; Eng. trans., *Essay on the Beautiful*, 2nd ed. 1860); *Del Buono* (1842); and *Errori Filosofici di Antonio Rosmini* (1842). His political propaganda was set forth in *Del Primato Morale e Civile degli Italiani* (1843), which, with *Il Gesuita Moderno* (1846-7), paved the way for Gioberti's enthusiastic recall to Italy (1848), and his

appointment as deputy by Turin and Genoa, and finally as president of the Chamber. He spent his last years in Paris, where he published the important *Del Rinascimento Civile d'Italia* (1851). His dominant note echoes the Platonic idealism, contending for the embodiment of the *idea* in civilization. His works were placed upon the Index. See *Vita* (1848) by Massari, who issued an edition of his works in 11 vols. (1856-63); and books by P. de Nardi (1901), A. Saletti (1901), and F. P. Pugliese (1902).

Giocondo, GIOVANNI (1435-1515), Italian architect and antiquarian, born at Verona; became a Franciscan. He prepared editions of Vitruvius (1511) and other Roman writers; was architect to the king of Naples (1489-95); constructed (1499) the bridge of Notre Dame at Paris; fortified (1509) the city of Treviso; and was summoned (1513) to Rome by Leo X., after the death of Bramante, to complete the building of St. Peter's. He was the tutor of J. C. Scaliger.

Gioia del Colle, tn., Italy, prov. Bari, 34 m. by rail s. of Bari. Pop. (1901) 21,831.

Gioiosa Jonica, comm., Italy, prov. and 65 m. by rail N.E. of Reggio di Calabria. Pop. (1901) 11,200.

Giolitti, GIOVANNI (1844), Italian statesman, born at Mondovì. He served in the Treasury, and became head of the Treasury under Crispi in 1889. In 1892 he united the premiership with the ministry of the interior. His administration was marred by his attitude towards the bank scandals. Though his personal honesty was not involved, he was practically compelled to resign in November 1893. He was minister of the interior in the Zanardelli cabinet of 1901, premier and minister of the interior 1903-5, and again in 1906.

Giordani, PIETRO (1774-1848), Italian patriot and author, was born at Piacenza. In 1808 he became secretary of the academy of Bologna. But his political views cost him his office (1815), and from that period till his death his life was one long battle for the cause of liberty. Giordani was one of the most profound Greek and Latin scholars of his day; and his *Opere* (1851; again in 1854-8, 14 vols.), mostly treatises upon art and literature, are written in a majestic and elaborate style which is regarded as a model for Italian prose. His letters, *Epistolario di Pietro Giordani* (included in the 1854-8 edition of his *Opere*), are of much political and literary interest. See *Life* by Romani (1868).

Giordano, LUCA (1632-1705), nicknamed FA PRESTO ('Look

Alive'), Italian painter, born at Naples. Painter to the king of Spain, he was called to Madrid (1692), and decorated the main staircase at the Escurial, painted the church there, and the cathedral of Toledo. He left behind a vast number of pictures. His chief works are *Christ Expelling the Traders from the Temple* (Naples), frescoes of *Moses and the Brazen Serpent* (Certosa at Pavia), and *Judgment of Paris* (Berlin Museum).

Giorgio, FRANCESCO DI (1439-1502), Italian architect, a native of Siena. Among other things he was a military engineer, and executed several works for the duke of Urbino, at whose court he lived until 1495. He made designs for the dome of Milan Cathedral and the cathedral at Florence, but they were not adopted. A good example of his architectural skill is, however, the church of the Madonna del Calcinajo, near Cortona. Giorgio wrote an important *Trattato di Architettura, Civile e Militare*, which was issued in 1841. There are bronze angels of his fashioning in the cathedral at Siena.

Giorgione ('Big George'), the cognomen of GIORGIO BARBARELLI (c. 1478-1511), Venetian painter, one of the seven supreme colourists of the renaissance, was born at Castelfranco, near Treviso, where his *Madonna* still is. He lived in Venice and the Venetian provinces, and died of the plague. Caterina Cornaro, ex-queen of Cyprus, was his patroness. He invented the Venetian species of 'romance easel picture,' with episodes in *novella* form. His work is the embodiment of the joy and sunshine of life, and is the expression of a radiant artistic temperament. A pupil of Giovanni Bellini, he was influenced by Carpaccio, also, according to Vasari, by Leonardo after a visit of the latter to Venice (1500). He painted much in fresco, with Titian and others, but of it nothing remains. Instead of using oil as Bellini did, he preferred to paint his easel pictures in *tempera*, glazed with oil—a process that has preserved the brilliancy of his 'flaming colouring.' His authentic works are *The Madonna with SS. Francis and Liberale* (Castelfranco); *The Sleeping Venus* (Dresden); *Fête Champêtre* (Louvre); *The Family of Giorgione* (Giovannelli Palace, Venice); *The Three Philosophers* (Vienna); *The Concert* (Pitti Palace, Florence). To a second and less certain group attributed to him belong *The Head of a Shepherd* (Hampton Court) and *A Knight in Armour* (National Gallery, London). See Herbert Cook's *Giorgione* (1900).

Giotto, whose real name was TOMMASO DI STEFANO (1264-57), Florentine painter, who, being a pupil of Giotto, was called for the sake of distinction Giotto. The frescoes representing the *Miracles of St. Silvestro* in the church of Santa Croce at Florence are believed to be by his hand, as is a painting of the *Apparition of the Virgin to St. Bernard* in the Florentine Academy. The later date of the frescoes representing the *Life of St. Nicholas* in the lower church at Assisi, ascribed to Giotto, has raised a doubt whether there were not two individuals whose work passes under this name.

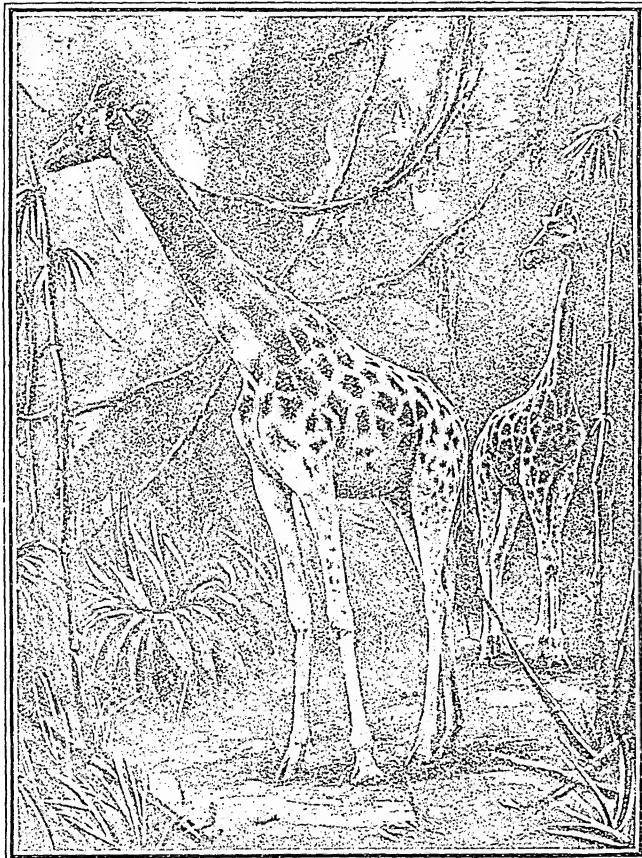
Giotto di Bondone (1276-1337), one of the most eminent of Italian artists and architects, son of a peasant at Vespignano, near Florence. Cimabue took him into his own house when he was about thirteen. Unsatisfied with traditional types, Giotto took nature for his teacher, and so gifted was he with imagination, pictorial invention, knowledge of the resources of painting, and above all with dramatic expression, that he effected a transition for all time in art. Many of his early works have perished; others have been rescued from beneath whitewash, as in the Bargello at Florence, where he painted a portrait of Dante in Paradise. Giotto was invited to Rome about 1298, and executed the famous mosaic in the vestibule of St. Peter's called the *Navicella*, or *Disciples in a Ship amid Tempest*. Giotto's most elaborate remaining work in painting is in the Arena chapel at Padua, begun in 1306, a series of thirty-eight subjects from the life of the Virgin and of Christ, fourteen cardinal virtues and their opposing vices, a lunette, and a *Last Judgment*. The influence of Dante, who was then living in Padua, seems apparent in this painted poem. (See Ruskin's *Giotto and his Works at Padua*, new ed. 1900.) At Assisi Giotto painted the ceiling of the lower church with the Franciscan allegories of *Poverty*, *Chastity*, and *Obedience*; and at Naples some of his work may be seen in the convent of Santa Chiara. In 1334 Giotto was summoned to Florence, to complete the great work of Santa Maria del Fiore, the cathedral. The exquisite campanile and the façade are Giotto's design, carried out by his successor, Andrea Pisano, and his own pupils. See Colvin's 'Giotto's Gospel of Labour' in *Macmillan's Magazine* for April 1877; Ruskin's 'Shepherd's Tower' in *Mornings in Florence* (1886), and his *Seven Lamps of Architecture* (new ed. 1880); Quilter's *Giotto* (1881); De Sincourt's *Giotto* (1905).

Giovinazzo, seapt. tn., prov. Bari, Italy, on the Adriatic, 12 m. by rail N.W. of Bari; is an episcopal see, and has a fortified castle. It manufactures brandy and fish-nets. Pop. (1901) 11,617.

Giovio, PAOLO (1483-1552), also known as JOVIUS, Italian historian, was a native of Como, where he practised as a physician. His *Historiarum sui Temporis Libri XLV.* (1550-2) and his *Elogia Virorum Bellica Virtute Illustrium* were translated into

Gipsy. See GYPSIES.

Giraffe, or CAMELOPARD (*Giraffa camelopardalis*), an even-toed ungulate, confined to Africa. Owing to the great length of the neck and of the limbs, the giraffe is by far the tallest of mammals. In the ordinary giraffe there are two 'horns,' or bony prominences, only a few inches in length, and covered with hairy skin; and there is, in addition, a dome-shaped protuberance between the eyes, sometimes called the third



The Giraffe or Camelopard.

Italian by Domenichi (1549-57), who also issued *Lettere Volgari di Paolo Giovio* (1560). Modern scholars dispute the accuracy and disinterestedness of his historical work.

Gippsland, the S.E. district of Victoria, Australia; has an area of 13,900 sq. m. It is rugged and mountainous in the N. and E., and in the S. and W. is very suitable for farming and cattle-grazing. Its mineral resources are very great—gold, silver, copper, lead, tin, and coal being found.

horn. A giraffe recently obtained from Central Africa by Sir Harry Johnston had five horns. The paired 'horns' differ from the horn cores of sheep and oxen in being at first quite separate from the bones of the skull; they are never shed, but retain throughout life their hairy covering. Among other important structural peculiarities of the giraffe, there are only two toes on both fore and hind feet, and the canines as well as the incisors are absent in the upper jaw.

The length of neck and limbs enables the animals to browse with ease on the young shoots of high trees. The bulls may reach a height of eighteen or nineteen feet, while the females are considerably smaller. The giraffe is now greatly reduced in numbers, and has been entirely exterminated from the region south of the Limpopo. In spite of the nature of the diet, the giraffe is a desert and not a forest animal. It drinks but seldom, and in drinking is obliged to separate the front legs sideways in order to reach the water. The hoofs are large, and can be used as weapons with great force, the bulls employing them in their combats with one another after the fashion of stallions. The giraffe lives in herds, with an old male as leader. Its nearest living ally is the recently discovered okapi, but there are not a few fossil forms related to it.

Giraldus Cambrensis (?1146-?1220), properly GIRALDUS DE BARRI, Welsh writer. Born in Pembrokeshire, he took orders (1172), attempted to reform the morals of the clergy, and was thrice elected to the see of St. Davids, but his election was overruled by the king and vetoed by the Pope. He was a private chaplain to Henry II., whom he accompanied in his expedition to France. His influence was used for the pacification of Wales, and he was also preceptor to Prince John, with whom he travelled in Ireland (1185). He was author of *Itinerarium Cambriae* and *Topographia Hibernica*. His Works were published in 7 vols. in 1861-77 by Brewer and Dimock.

Girard, PHILIPPE DE (1775-1843), French mechanician, born at Lourmarin (Vaucluse), invented the first successful flax-spinning machine, for which a prize of a million francs had been offered by Napoleon. Disappointed of the reward by Napoleon's fall, Girard went to Austria (1815), where he conducted a flax-mill at Hirtenberg, near Vienna, and built the first steamships on the Danube (1818). He was also chief engineer (1825) of the Polish mines. See E. Deschamps's *P. de Girard* (2nd ed. 1853).

Girard, STEPHEN (1750-1831), American millionaire and philanthropist, born at Bordeaux in France; settled (1769) at Philadelphia, U.S.A. Here his commercial ventures met with signal success; and during the war of 1812-14 he was able to supply a large loan to the government through the bank of which he was the founder (1812). He left means for the establishment and maintenance of a college at Philadelphia for over fifteen hundred orphans, insti-

tuted 1848. See Ingram's *Life and Character of Stephen Girard* (1884); also *Handbook to Girard College*, ed. Scattergood (1888).

Girardin, EMILE DE (1806-81), French journalist, author, and politician, was born at Paris. His novel, *Emile* (1827), which was published anonymously, pleaded the cause of illegitimate children. Turning his attention to journalism, he founded the *Journal des Connaissances Utiles* (1831) and the *Musée des Familles* (1832), followed in 1836 by *La Presse*, the first fruit of his endeavour to supply the people with a cheap newspaper. Another scheme was realized in the *Pantheon Littéraire*, a series of volumes issued at a franc each. His abounding energy also sought scope in politics. Entering the Chamber of Deputies in 1834, he at first sided with the Conservatives, but later transferred his sympathies to the Republican party. In the *Liberté*, founded in 1867, he indulged in vigorous polemics against Prussia. Among his later enterprises was the foundation of the journal *La France* in 1874. In 1831 he married Delphine Gay (1804-55), who is remembered chiefly as the authoress of the brilliant sketches reprinted as *Lettres Parisiennes* (1843). Her poems, *Essais Poétiques* (1824-6), *Nouveaux Essais Poétiques* (1825), *Napoléine* (1833), and others, won a wide recognition. She was, however, even more successful in fiction and the drama. Among her romances are *Contes d'une Vieille Fille à ses Neveux* (1832), and *La Canne de M. de Balzac* (1836); and among her dramas, *L'Ecole des Journalistes* (1840), *Judith* (1843), *Lady Tartuffe* (1853), and *La Joie fait Peur* (1854), dramatized in English as *Kerry*. See G. d'Heilly's *Madame de Girardin* (1868), and Saint-Amand's *Madame de Girardin* (5th ed. 1888).

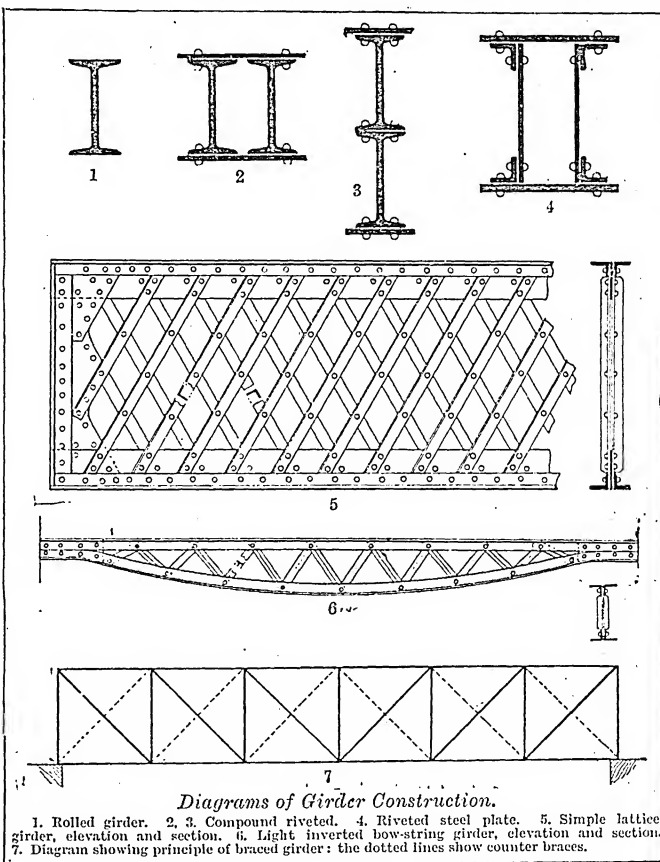
Girardin, F. A. See SAINT-MARC GIRARDIN.

Girardon, FRANÇOIS (1628-1715), French sculptor, born at Troyes; worked at the decoration of the royal palace at Versailles and the Trianon palace under Le Brun. In 1657 he was admitted to the Academy of Painting and Sculpture, and nominated professor (1659). He married the flower painter Catherine Duchemin, and counted Condé, Boileau, La Fontaine, and Racine among his friends. His *chef-d'œuvre* is the *Tomb of Richelieu* in the Sorbonne (Paris).

Girasol, the French name for fire opal, a variety of common opal which has a dark-red colour, and is found in Mexico filling cavities in a trachyte. It is used for making rings and various ornaments.

Girder, a beam of steel or iron, resting on supports at either end, and bearing a load which may be concentrated at one or more points or distributed throughout its unsupported length. The most general application of girders is in connection with bridges, of which (when of steel or iron) they form the chief component parts. Main girders serve to carry the superstructure and moving load over the opening which is spanned; cross girders connect these transversely, and support

by a (thinner) vertical web plate, the most efficient depth of the latter being from one-tenth to one-twelfth the effective length of the girder. For spans of over a hundred feet the solid web plate is more usually replaced by a system of diagonal or lattice bracing, consisting of alternate struts and ties, which serve to transmit the web stresses from the centre of the girder towards each abutment. In bowstring girders the upper flange is curved so as to make the depth of the



the flooring; while in many railway bridges a third series, of small longitudinal girders, runs throughout under the rails of each track. Girders are also largely employed to carry the floors and superincumbent walls of high modern buildings; to bear the ends of principal rafters in a series of transverse pointed roofs; and, generally speaking, to form the horizontal weight-bearing members in every variety of steel and iron structure.

Girders usually consist of two wide horizontal flanges connected

by a (thinner) vertical web plate, the most efficient depth of the latter being from one-tenth to one-twelfth the effective length of the girder. For spans of over a hundred feet the solid web plate is more usually replaced by a system of diagonal or lattice bracing, consisting of alternate struts and ties, which serve to transmit the web stresses from the centre of the girder towards each abutment. In bowstring girders the upper flange is curved so as to make the depth of the

Girgeh, or **GIRGA**, tn., Upper Egypt, on w. bk. of the Nile, 336 m. s. of Cairo. The inhabitants are mainly Christians, and there is a Latin monastery. Abydos lies 10 m. to the s.e. Pop. (1900) about 15,000.

Girgenti. (r.) Province, Sicily, Italy; lies on the s. coast, is

hilly, and produces olive oil, cereals, sulphur, fruits, and fish. Area, 1,172 sq. m. Pop. (1901) 371,638. (2.) Episcopal city of Sicily, cap. of above prov.; stands near the s. coast, 60 m. s.w. of Palermo. Through its port, Porto Empedocle, 3 m. distant, it exports sulphur. It is the successor of the ancient Agragas or Agrigentum, which was founded in 582, and flourished between c. 560 and 406 B.C., and again during the first and second Punic wars. From 828 to 1086 it was in the hands of the Saracens. Fine specimens of Greek temples remain. The modern buildings

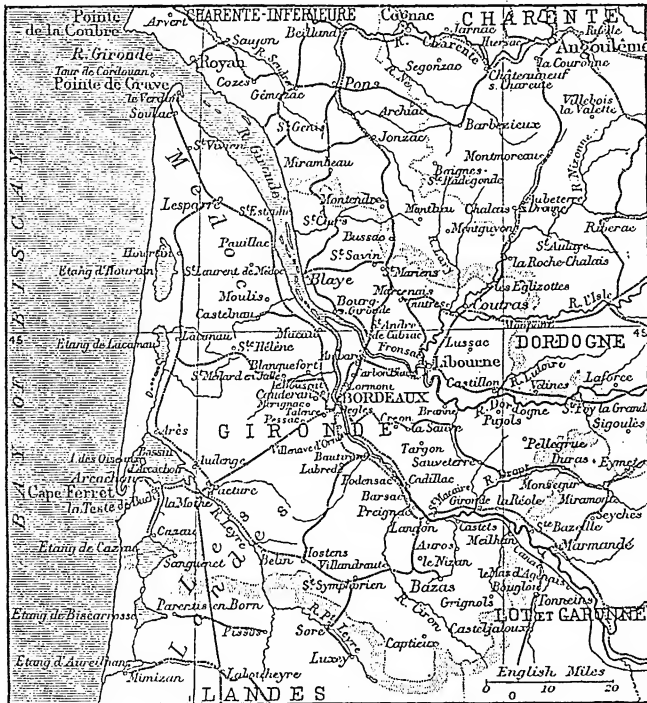
Area, 4,140 sq. m.; pop. (1901) 821,131. It is divided into the Landes on the w., and the basin of the Gironde. The Landes consist of a strip of dunes from 2 to 4 m. broad and 75 m. long, and from 100 to 300 ft. high, covered with pine trees, from N. to S. a chain of lakes or *étangs* (one the Bassin d'Arcachon, communicating with the sea), and a sandy plain. The whole activity of the inhabitants is directed to the cultivation of the vine and to wine-making. Fruit, vegetables, and grain are produced. Bordeaux is the capital. Arcachon is a health resort. (2.) Sal-water

Isnard, Pétiou, Barbaroux, Condorcet, and Roland; but from the first the beautiful and talented Madame Roland had a great, though usually an indirect, influence with them. A Girondist ministry was appointed in March 1792. They had some share, of a secret kind, in bringing about the movements of June 20 and Aug. 10, 1792, which resulted in the overthrow of the monarchy, but may be acquitted of all complicity in the September massacres. They were overthrown in June 1793, and many of them were subsequently guillotined. Their name has become a byword for a certain type of politician—idealist, enthusiastic, but visionary and unfortunate. See Lamar-tine's *Histoire des Girondins* (1847; Eng. trans. 1847).

Girouard, DESIRÉ (1836), Canadian judge, born at St. Timothée in Quebec; from 1860 to 1895 practised at the Montreal bar. From 1878 to 1896 he was a member of the Canadian Parliament, sitting for Jacques Cartier, and in 1895 was appointed a judge in the Canadian Supreme Court of Justice. Girouard has published *Essai sur les Lettres de Change* (1860), and *Lake St. Louis* (1893, 1900; new ed. 1903), a series of historical essays.

Girouard, SIR EDOUARD PERCY CRANWILL (1867), British soldier, son of the above, was born in Montreal; entered the British army (Royal Engineers) in 1888. In 1896 he was chosen to go out to Egypt with the Dongola expedition under Kitchener. He built the Sudan military railway to the Atbara. After that Girouard was appointed director-general of the Sudan railways. He was with the Nile expedition in 1897, and in the following year was appointed president of the Egyptian Railway Board. On the outbreak of the Boer war he proceeded to S. Africa, and served throughout the campaign (1899-1902). From 1902 to 1904 he was commissioner of railways in the Transvaal Colony and Orange River Colony, and early in 1905 was appointed staff-officer to the Royal Engineers, Eastern Command.

Girtin, THOMAS (1773 or 1775-1802), English landscape and water-colour painter, born in London, the friend and precursor of Turner. He strongly influenced the early development of British painting in water colour, and widened the range of his art by 'laying in' his pictures with local colour instead of working the shadows in neutral tints, and by his truth of tone and freedom of composition. He was an accomplished draughtsman and master of expression in pure line. See L. Binyon's *T. Girtin, his Life and Works* (1900).



The Gironde.

include a cathedral, library, and museum. Pop. (1901) 25,024.

Giriama, region of British E. Africa, stretching 60 m. from Sabaki river on the N. to the Rabai hills on the S., 30 to 40 m. in breadth, producing millet and Indian corn. Pop. about 73,000.

Girnār, sacred hill in the feudatory state of Palitana, Kathiawar, Bombay, India, noted for its Jain temples.

Giron, tn., Santander, Colombia, on the Lebrija; with tobacco and gold mines. Pop. 12,500.

Gironde. (1.) Department in s.w. of France, on the lower Garonne and Dordogne, with the Bay of Biscay on the w.

estuary on the w. coast of France, formed by the rivers Garonne and Dordogne. It forms the waterway to Bordeaux (66 m.), is from 2 to 6 m. wide, and as far as Pauillac is accessible to the largest ships, but beyond that it is difficult to get a clear channel.

Girondists, one of the chief revolutionary parties which arose during the course of the French revolution. They first appeared in the Legislative Assembly of the year 1791, several of their leaders being returned for the department of the Gironde. They were at first closely allied with the Jacobins. The leading figures were Brissot, Vergniaud, Buzot,

Girton College, for the higher education of women, was founded in 1869 at Hitchin, and moved after three years to Cambridge. The students are usually in residence for three or four years, and may also attend the university lectures, with the exception of the medical course. There were nearly 200 students in 1905.

Girvan, tn. and par. (14,950 ac.), Ayrshire, Scotland, 21 m. s.s.w. of Ayr; watering-place; herring-fishing. Pop. (1901) 4,024.

Gisborne, tn. and port of Poverty Bay, North Island of New Zealand, where Captain Cook landed in 1769. It is 85 m. N.E. of Napier. Pop. (1901) 2,733.

Gislason, KONRAD (1808-91), authority on the ancient languages of Northern Europe, was a native of Iceland, and was in 1832 appointed professor of his subject at Copenhagen University, resigning in 1886. Among his works are a manual of ancient Icelandic (1846), a Danish-Icelandic Dictionary (1851), and *Udvalg af Old-nordiske Skjaldekvad* (1892). He also edited old Icelandic works—*Gislason's* (1849) and *Njala* (1875-9).

Gisors, tn. in dep. Eure, France, 32 m. E.S.E. of Rouen; has fine old buildings and the ruins of a castle partly built by Henry II. of England. It manufactures cloth, linen, felt, leather, and glass. Pop. (1901) 4,861.

Gissing, GEORGE (1857-1903), English novelist and man of letters, born at Wakefield in Yorkshire. He belongs to the uncompromisingly realistic school of fiction, and has been not inaptly described as 'the historian of the middle classes.' Although Gissing was a conscientious literary artist, human life was to him too much a thing of minor tones and dull gray shades for his books to be very popular. His books were 'sordid' because he had found life painful and sordid; but there is not one which is not strengthening and ennobling if read aright. What, however, has been commonly overlooked in his work is the profound moral idea—the idea of social regeneration through individual and collective failure in material aims, and a brave consistency in the spiritual. The following are typical of his work: *Demos* (1886); *Thyrza* (1887); *The Nether World* (1889); *New Grub Street* (1891); *Born in Exile* (1892); *The Odd Women* (1893); *In the Year of Jubilee* (1894); *The Whirlpool* (1897); *The Town Traveller* (1898); and *Our Friend the Charlatan* (1901). Besides novels, he wrote an excellent appreciation of *Charles Dickens* (1898), and a collection of light and graceful sketches, *By the Ionian Sea* (1901), notable as a labour of love by a

busy novelist, whose natural inclinations were those of a classical scholar. A book of singular charm and insight, which showed great promise of a brighter outlook upon life, was *The Private Papers of Henry Ryecroft* (1903), to some extent an autobiography of Gissing himself. In 1905, *Will Warburton*, a romance, was published posthumously.

Gitschin, or JICIN, tn., Bohemia, Austria, 60 m. by rail N.E. of Prague; contains a castle built by Wallenstein in 1630. Sugar and paper are manufactured. Here in 1866 the Prussians defeated the Austrians. Pop. (1900) 9,790.

Giugliano in Campania, tn., Italy, prov. and 6 m. N.W. of Naples. Pop. (1901) 14,488.

Giuliani, GIAMBATTISTA (1818-84), Italian philologist and student of Dante, was born near Asti in Piedmont; devoted himself from 1843 onwards to the study of Dante. In 1847 he became professor of moral philosophy, and subsequently of rhetoric, at Genoa, and in 1860 went to Florence. Among his works are *Le Norme di Commentare la Divina Commedia* (1856); *La Vita Nuova e il Canzoniere di Dante* (1863); *Opere Latine di Dante Reintegrate nel Testo con Nuovi Commenti* (1878-82); also a commentary on the *Divina Commedia*, which is his greatest work.

Giulio Romano, more correctly GIULIO DI PIETRO FILIPPO DE' GIANNUZZI (c. 1492-1546), head of the Roman school of painting in succession to Raphael, was a native of Rome. He studied under Raphael, and assisted him in several of his leading works, especially in the Vatican series called *Raphael's Bible*, and in the *Benefactors of the Church*, in the salon of the Incendio del Borgo. By Raphael's will he was entrusted with the completion of the frescoes in the Sala di Costantino in the Vatican. Of the series, the *Battle of Constantine* and the *Apparition of the Cross* were executed solely by Giulio Romano. Towards the close of 1524 he was invited to Mantua by Federigo Gonzaga. He built half Mantua anew, erected numerous churches, restored the cathedral, and adorned the Castello and the Palazzo del Tè. He was gifted with a freedom of hand which gave life and animation to the creations of his fancy. After he left Rome, all trace of the scholar of Raphael, except in some features of external form, vanished. See D'Arco's *Vita e Opere di Giulio Romano* (1842), and Vasari's *Vite de' Pittori* (Eng. trans. by Foster, 1850).

Giurgiu, incorrectly GIURGEVO, tn., Roumania, opposite Rustchuk, on l. bk. of Danube,

40 m. by rail s.w. of Bucharest, and its port. Its fortifications were destroyed by the Russians in 1829, and in July 1854 the Turks here defeated the Russians. It exports grain, salt, and petroleum. Pop. (1900) 14,000.

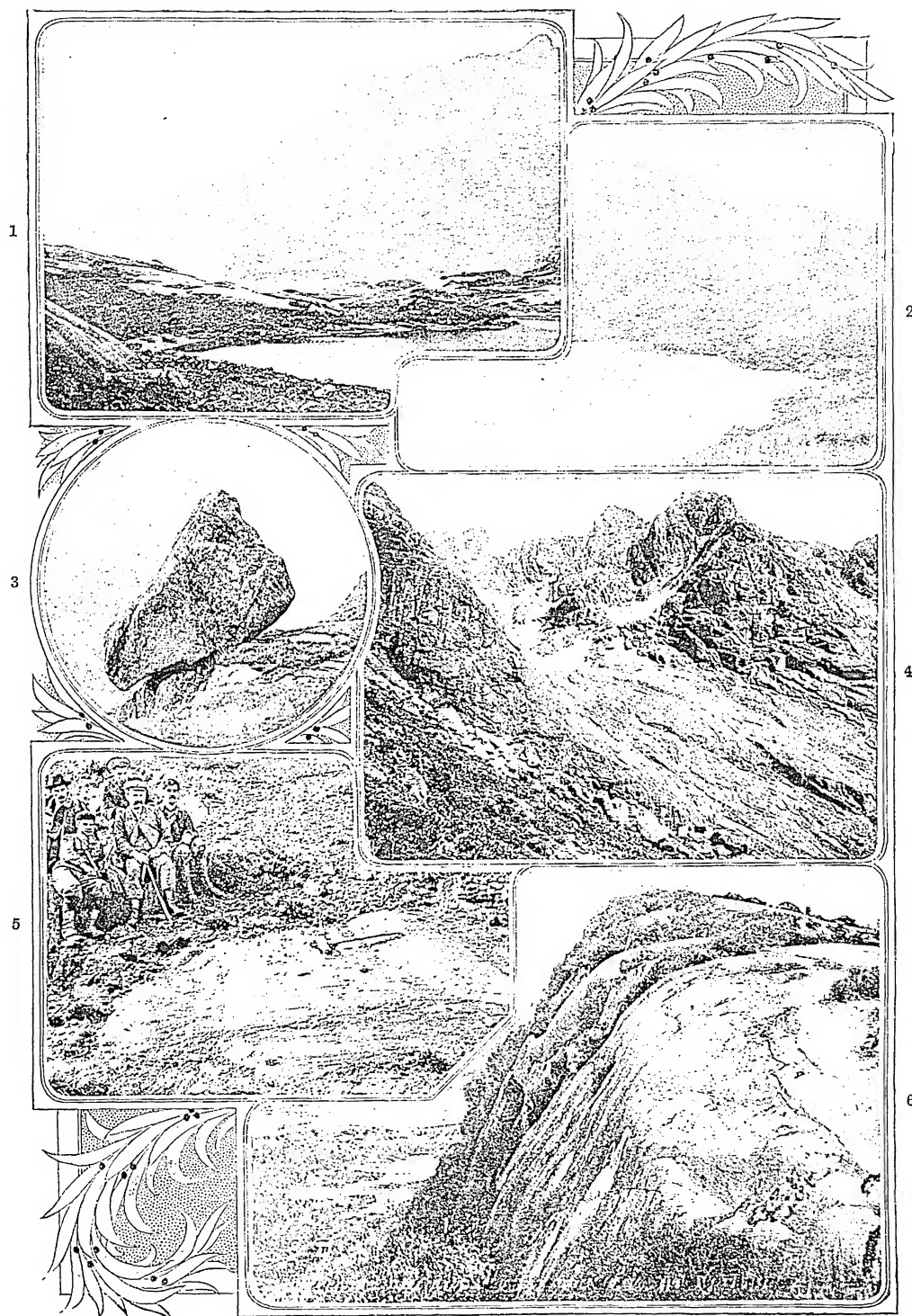
Giusti, GIUSEPPE (1809-50), Italian satirical poet, born at Monsummano, near Florence. He won recognition, while yet a student, by his poem *La Ghigliottiera* (the guillotine). His *Il Dies Irae* (1835) on the death of the Emperor Francis I., *Lo Stivale* (1836), and *Girella* (1840) led up to his most telling works—*Il Papato di Prete Pero*; *Gingillino*, an attack upon the management of the Treasury; and *Sant' Ambrogio* (1846). Although actively in sympathy with the liberation movement (1848), Giusti incurred the censure of his countrymen as reactionary by his criticisms of the more extravagant theories of his time. See Biography prefixed to Carducci's edition of Giusti's *Poesie* (3rd ed. 1879); Biggi's *Vita di G. Giusti* (1893); Horner's *The Tuscan Poet G. Giusti and his Times* (1864).

Givet, tn. in dep. Ardennes, France, on the Meuse, 26 m. N. of Mézières. The old town (Grand Givet) is on the l. bk. of the Meuse. The town has iron, steel, copper, and zinc works, and pencil, glue, and sealing-wax factories. Blue marble is quarried near. The citadel of Charlemont was built by the Emperor Charles V. The fortifications were partly dismantled in 1892. Pop. (1901) 6,947.

Givors, tn. in dep. Rhône, France, on r. bk. of the Rhone, 12 m. S. of Lyons; manufactures iron, bottles, window-glass, and chemicals. There are coal mines. Pop. (1901) 12,132.

Gizeh. (1.) Province of Upper Egypt; area, 370 sq. m. Pop. (1897) 401,634. (2.) Village, on l. bk. of Nile, Egypt, 3 m. from Cairo. The Nile is here spanned by a railway bridge. Five miles to the W. are the great pyramids, and in the neighbourhood the Sphinx and the ruins of Memphis. Pop. 11,500.

Gizzard, a name given in zoology to a portion of the alimentary canal which is structurally adapted for the grinding of food. The grinding apparatus may, as in the crayfish, be constituted by teeth arising on the walls of the organ itself; or, as in the common fowl, may be produced by pebbles, etc., swallowed by the animal. In crustaceans and insects the gizzard, when present, is formed of the outer layer (ectoderm), and is lined by a protective layer of chitin, similar to that which covers the exterior of the body. In birds it is lined by a hardened glandular secretion.



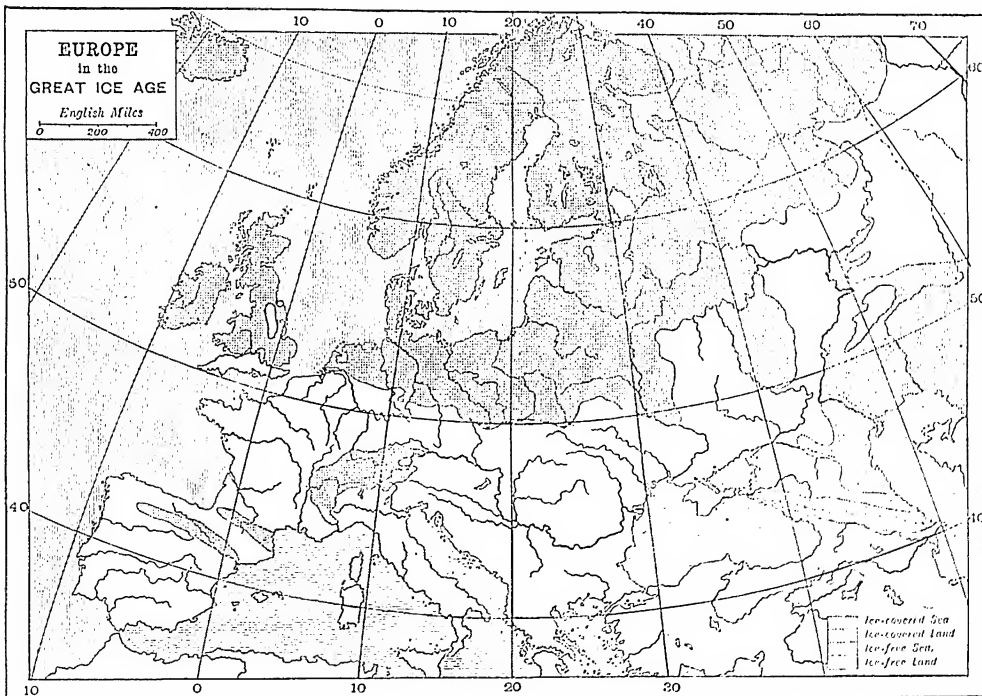
Effects of Glacial Action.

1. Glacial action on rocks, Loch Coruisk, Skye. (Photo by Norrie, Fraserburgh.) 2. Moraine mounds, Easedale. (Photo by G. Bingley, Headingley.) 3. Perched block of felstone, Llanberis Pass. (Photo by G. Bingley.) 4. Track of a glacier, Corrie Loggan, Skye. (Photo by Norrie.) 5. Striated granite, Wasdale Crag, Shap. (Photo by G. Bingley.) 6. Ice-rounded bluff, Loo Bridge, Kerry. (Photo by R. Welch, Belfast.)

Gjellerup, KARL ADOLF (1837), Danish author, born at Rønholte (S.E. Zealand); under the pseudonym of Epigonos wrote his first novel, *En Idealist*, in 1879, which was followed by *De Unge Danmark* (1880), *Germarnernes Lærling* (1882), *Romulus* (1889), and *Minna* (1898). His radicalism is observable in the collection of poems entitled *Rödljörn* (1882), and in *Aander og Tider* (1882), observations addressed to Darwin. He has also written *Vandreaaret* (1885), a series of reflections, and some fine tragedies, among others *Brynhild* (1884), and especially *Thamyris* (1887) and *Herman Vandel* (1891).

of the northern hemisphere was very similar to that of Greenland or the Antarctic regions at the present day is incontrovertible. At the climax of the Glacial Period a thick mantle of ice covered a very large part of the northern hemisphere. From the high mountain plateau which forms the backbone of the Scandinavian peninsula the ice radiated outwards over the low grounds of Northern Russia, Poland, North Germany, and Denmark. It filled up the basin of the Baltic and even of the North Sea, for we know that the Scandinavian ice-sheet passed out to the Atlantic over the Shetlands,

it was confluent with the great Scandinavian ice sheet; on the west it passed out into the Atlantic, and must have reached to beyond the 100-fathom line, where it faced the sea in icy cliffs, from which glaciers were continually being shed. This enormous mass was in continual motion, and we can trace the direction of its flow by means of the scratches which the stones embedded in its lower layers engraved on the rock surfaces over which they passed. The general tendency was to take a downward course, and from the central watershed of the northern highlands the movement was directed



Glaber, RODOLPHE or RAOU, (d. 1050), French monkish chronicler, composed a *Historia* extending from 900 to 1046, which is reproduced in translation by Guizot. He was a monk of Clugny.

Glabrio, MARCUS ACILIUS, consul at Rome in 191 B.C., was entrusted with the conduct of the war against Antiochus the Great, king of Syria, in Greece, whom he routed at Thermopylae in 191.

Glacial Period is the earlier of the two subdivisions of Quaternary time, and is known also as the Great Ice Age, and as the Pleistocene Epoch. The evidence that at no very distant date—in a geological sense—the climate of Europe, N. America, and most

and hemmed in the British ice off the coasts of Yorkshire and Aberdeenshire. Well-known Norwegian rocks are found in the Fen district and near Flamborough Head, showing that the North Sea was completely occupied by the ice, and that before it melted away it reached the British Islands. The thickness of this great mass was probably not less than 5,000 ft.

The Highlands of Scotland and the hills of the north of England nourished an independent ice sheet, which covered most of the British Islands north of a line drawn somewhat north of the Thames to near the mouth of the Bristol Channel. On the east

outwards on each side. The Outer Hebrides were buried in ice which came from the mountains of Sutherland, Ross, and Inverness, while the plains of Moray and of Aberdeenshire were occupied by ice moving towards the basin of the North Sea from the interior of the country. The central plains of Scotland were traversed by an ice sheet which took its origin in the mountains of Perth, Argyle, and Inverness. Scottish ice flowed down the Clyde valley, and reached the north of Ireland, the south of Wales, and the English Midlands, as is shown by the boulders of Ailsa Craig granite which it left in these localities. From the north of England and

the southern uplands of Scotland the ice spread out over the plains of Yorkshire and the centre of England, and carried with it boulders of many rocks, the source of which can easily be identified. This general direction of movement down the steepest slopes and radially outwards from the principal areas of high land was not sensibly interfered with by the presence of the smaller hill ranges. The Pentlands and the Ochills were crossed by the great Highland ice sheet, beneath which their summits were deeply buried. From the centre of Ireland ice streams radiated outward on all sides, crossing the intervening ridges to reach the sea. But the great Scandinavian ice sheet, which blocked the North Sea and touched the Yorkshire coast, obstructed the eastward flow of part of the Scottish ice, and turned it southwards and northwards along the present shore lines, till finally it escaped to the Atlantic by moving in a north-westward direction over Caithness and the Orkneys.

In the Alps the present glaciers are merely the attenuated remains of the great ice streams of the Glacial Period. The plains of Switzerland were crossed by ice fields which abutted on the Jura Mountains, and an enormous glacier occupied a large part of the Rhone valley. Along the northern foot of the mountains and in Tyrol the extension of the ice was correspondingly great, and on the Italian side the glaciers debouched on the Piedmont plains, and have left their terminal moraines (from 1,200 to 2,000 ft. high) in a great amphitheatre around Ivrea. In the Urals also, and in the Pyrenees, there is abundant evidence of a much greater extension of the ice in the Glacial Epoch than at present.

Much of South Germany was free from ice, and crossed by streams swollen by the waters from the melting ice, and turbid with rock debris. The plains of France, Italy, and Spain, Southern Russia, and England south of the Thames, though covered by no ice sheet, were locked in frost for a considerable portion of the year. In such situations there is often a great accumulation of shattered rock fragments, forming breccias, belonging to the Glacial Period.

Similar conditions prevailed also in N. America, and the surface of that continent north of New York and Ohio is covered with boulder clay, drumlins, and glacial deposits which exactly resemble those of Northern Europe. The radiating point of the ice-flow was in the elevated Canadian

plateau north of the great lakes. A series of hills, the terminal moraines of the Ice Age, can be traced almost across the continent.

It is now clear that periods during which Arctic conditions prevailed alternated with others in which the climate was mild and temperate. Professor James Geikie, who has made a profound study of this subject, has arrived at the conclusion that in Europe there were four periods of glaciation alternating with three interglacial periods. The most important glaciations were the second and third, and the great boulder clay of the lower grounds is mostly the ground moraine of their ice sheets. The interglacial periods were long and warm, and the surface was covered with forests, with pools and bogs in which water-plants grew. It is probable that man lived in Britain, at any rate, during the later interglacial periods, though some believe that the human race existed in Western Europe before the Ice Age. The cave and river-gravel deposits, in which the earliest flint implements are found in the south of Britain and the north of France, are generally believed to be of late glacial date.

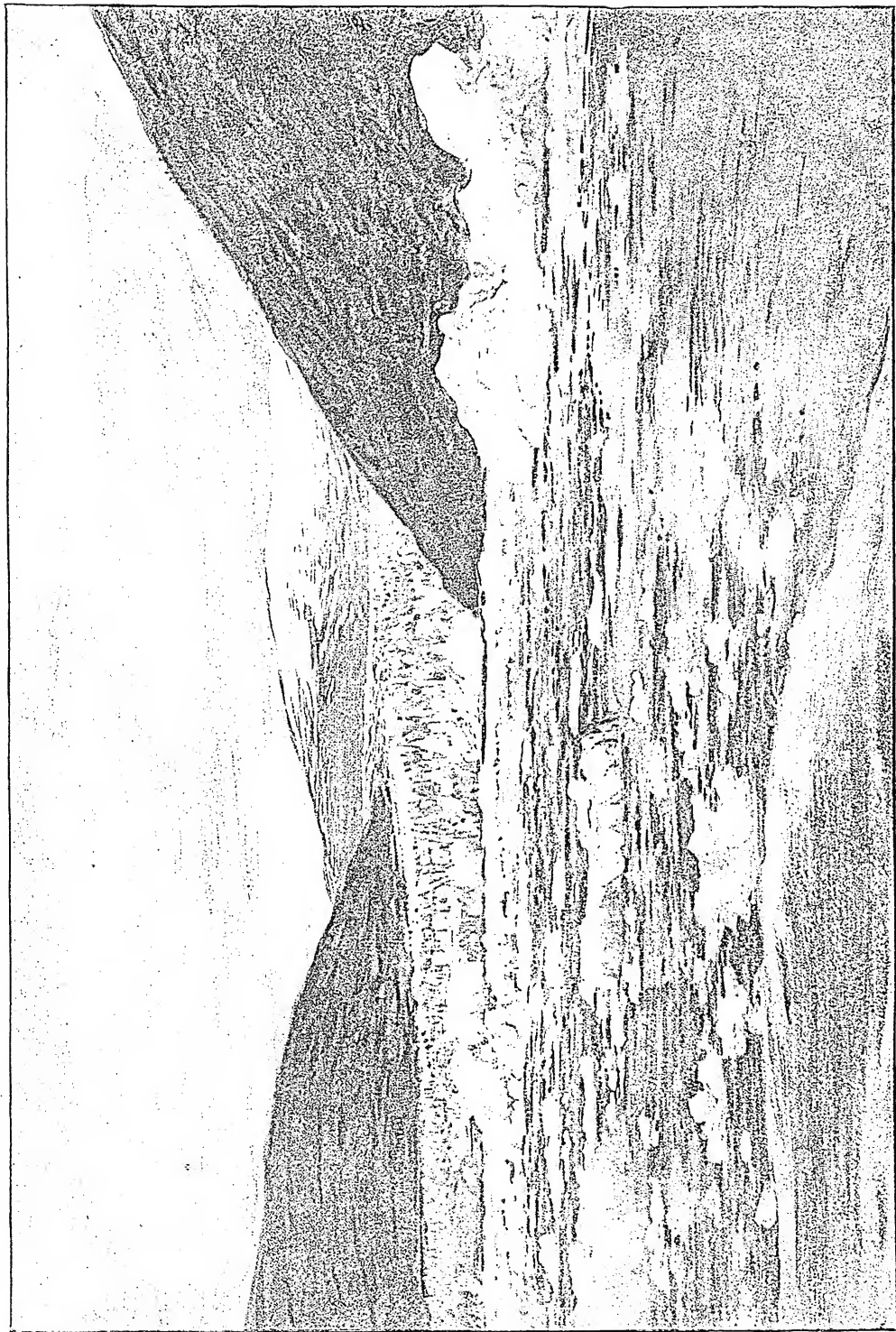
There is as yet no general agreement among geologists as to the real cause of the Ice Age. Many have regarded it as due to astronomical changes—for instance, James Croll and Professor Ball. Others have suggested that the solar system, in its progress through space, enters regions of low temperature. A newer theory supposes that the sun is a variable star. Changes of level of land and sea have also been suggested, and the diversion of the Gulf Stream by the submergence of the isthmus of Panama was at one time a popular explanation.

The effects of the Glacial Period can only be very briefly alluded to here, such as the smoothed and striated rock surfaces, the deposits of boulder clay, erratics, and gravels, the sheets of sand in the river valleys, and the moraines, kames, and eskers of the glaciated districts. The abundance of lakes and tarns in glaciated regions indicates that they are in some way due to the action of ice sheets. The smoothed and U-shaped valleys, with lines of lateral and terminal moraines, and the frequent occurrence of crag and tail, are both widespread features of glacial origin. Many geologists hold that the deep-sea lochs of Scotland and the fiords of Norway have been in large measure produced by the erosive action of ice.

Bibliography.—James Geikie's

Great Ice Age (3rd ed. 1894) is the standard work, also his *Earth Sculpture* (1898); Bonney's *Ice Work* (1896); Wright's *Man and the Glacial Period* (1892), and *Ice Age in North America* (1889); Croll's *Climate and Time* (1885); Carvill Lewis's *Glacial Geology of Great Britain* (1895); Boyd Dawkins's *Early Man in Britain* (1880). The cause of the Ice Age is discussed by Croll, in *Climate and Time* (1885); Sir R. S. Ball, in *The Cause of the Ice Age* (2nd ed. 1892).

Glaciation. The glaciers of Switzerland sometimes slowly recede at their lower ends for a period of forty or fifty years, and when their channels are thus exposed to view, it is possible to make an accurate investigation of the characteristics of a glaciated valley. On each side lie mounds of debris, the lateral moraines, which were carried down by the glacier during its period of extension. They are often in successive ridges, one below the other, marking stages in the retreat. Crescent-shaped mounds, rounded, irregular, often discontinuous, sweep across the valley—the terminal moraines. They are mixed with sand and gravel, which may also extend over much of the rocky floor; but where that can be seen, it is rounded, smoothed, and striated with grooves and scratches, which are sub-parallel, and mostly lie in the direction of the axis of the glacier. The rounded surfaces are known as *roches moutonnées*, and are usually more perfect on one side than on the other, for that side which looks up the valley has received the full impact of the ice, and is much worn and polished, while the other side (which has been called the lee side) may still be rugged and uneven. Erratic boulders and perched blocks are strewn over the ground, and in the moraines there is a mixture of materials which have come from some distance up the glacier with others belonging to the rocks on which they lie. Where the slopes are steep and their movement is rapid, glaciers powerfully abrade the rocks by means of the moving layer of ground moraine which they drag forward. Where the gradients are gentle and the movement slow, they tend rather to deposit what they have accumulated and to lay down great masses of boulder clay and till. Many geologists have held the opinion that certain lakes are due to glacial erosion, and have ascribed to a glacier the power of hollowing out part of its bed to form a rock basin. This has been strenuously denied, but the intimate connection between glaciation and the occurrence of lakes is sufficiently



Foster Glacier, Taku Inlet, Alaska.

Glaciers are rivers of snow compacted by pressure into ice, and move as a river of water does, though far more slowly, from a higher to a lower level. They originate in snow-fields, great basin-shaped areas in snow-clad mountains. They are very largely distributed over the surface of the globe.

established by the fact that lakes are immensely more abundant within the boundary of the glaciated country than beyond it. Many of them are tarns in hollows of the boulder clay; others are valleys dammed by moraines; and still others are deep rock basins which have been excavated by moving ice. See books cited under GLACIAL PERIOD.

Glaciers. The altitude of the snow-line, or level above which the snow is permanent, varies with the latitude of the place. In Spitzbergen (77° N. lat.) it is about 1,500 ft., in Norway (66° N. lat.) about 3,000 ft., in the Alps (from 45° to 47° N. lat.) about 9,000 ft., and in the Himalayas (from 27° to 37° N. lat.) from 15,000 to 19,000 ft. above the sea. Where more snow falls through the winter than is melted during the remainder of the year, it would go on accumulating, and would finally reach enormous thicknesses, were it not that the excess is drained away regularly by means of glaciers. A glacier is, in fact, a river of snow, moving in much the same manner as a river of water, though far more slowly; and, like the latter, it draws its supply from the rainfall over the area of its basin.

Glaciers originate in snow-fields, great concave basin-shaped areas in the snow-clad mountains. Much of the highest ground is really clear of snow, partly because the slope is great, and partly because the furious winds which prevail during mountain storms sweep away the snowfall into the sheltered hollows. In the snow-fields the deeper layers gradually pass into ice, partly owing to the water which filters through the pores during the hotter hours of the summer day and freezes at lower depths, partly to the pressure of the superincumbent layers. This granular porous ice is known as *firn* or *névé*. It is in a condition of very slow motion, and at the lower lip of the basin the firn passes gradually into the glacier. Agassiz, Tyndall, and the various Alpine clubs have given us very accurate data regarding the rate of motion of many Alpine glaciers. De Saussure's ladder, which fell into a fissure on the Mer de Glace (Mont Blanc) in the year 1788, was recovered in fragments in 1832, having travelled at the rate of about 130 yards in each year. The most thorough observations are based on the displacement of stones or stakes placed in a straight line across a glacier. In a few days the line became convex downwards, and measurements taken daily from a station on the rocks of the valley showed that the movement was slowest at the sides, and most rapid in the centre. This is owing to the

friction of the ice against the rocky walls. For the same reason, the surface moves more rapidly than the bottom. The average velocity of the ice of Alpine glaciers varies from 50 to 120 yards in the year, or from six to fifteen inches in the day. The great glaciers of the Arctic regions have a much more rapid flow. On the glacier of Jacobs-havn in Greenland a rate of movement equal to from 16 to 25 yards in a day has been recorded.

The ice itself shows obvious traces of the movement in the fissures or 'crevasses' with which it is intersected. These vary from several yards in width to an almost imperceptible crack, and they form suddenly with a cracking noise. Their walls are of clear blue ice, usually banded with layers of paler colour filled with bubbles of air. To the Alpine climber the crevasses are a source of much danger, especially when they are bridged over by a thin continuous layer of snow. The larger ones are crossed by means of ladders; and before crossing, the party is usually roped together. Some of them are from 500 to 700 feet in depth. At the edge of the glacier there is often a very large crevasse between the ice and the rock, known as a *bergschrund*.

Even at temperatures below the freezing-point the ice gradually wastes away by evaporation, and this process is greatly hastened by the advance of summer, the flow of water over the ice, and by showers of rain. The distance to which the glacier will ultimately descend depends on many factors, the most important being the magnitude of the body of ice and the temperature of the districts which it enters. In Spitzbergen, Norway, and Greenland some glaciers reach the sea, where they break up into fleets of icebergs. The Alpine glaciers end at an average altitude of about 6,000 feet above sea-level. Some of them—as, for example, the glacier of the Rhone—terminate in a rounded end, from which a turbid river flows. The lower part of a glacier, where melting is going on rapidly, is often tunnelled under by long caves and galleries, in which the streams flow. Evaporation and melting give rise to 'glacial tables'—pillars of ice surmounted by blocks of rock. The rock protects the ice in its shade, and while the general surface sinks, the block comes to stand upon a pedestal, because the ice beneath it is preserved. These tables may be from three feet to twelve feet high; after a time they become inclined, as the sunny side of the ice-pillar melts more rapidly than the other. Finally the block falls down,

and the process is resumed. The pressure of the ice behind keeps packing up the ice in front, and the surface of a glacier is in this way kept at an approximately constant level. Small stones in the ice often lie in little pools or hollows, as their dark surface is heated by the rays of the sun and melts the surrounding ice; only the larger blocks, which are too thick to be heated through and through, give rise to glacier tables.

The appearance of the surface of a glacier depends to some extent on the season of the year. In winter it is uniformly sheeted over with snow. In summer much of the covering which has fallen during the winter has melted away; the crevasses are obvious everywhere, with their walls of blue ice. Streams fall from the adjoining slopes, and are engulfed in the crevasses, making a loud noise as they tumble into the depths of the glacier. This has given rise to the name *moulins*, or mills. Where the ice is much broken, spires and 'seracs' rise in the air, consisting of solid ice with a partial covering of snow. See GLACIATION.

Glaciers are subject to considerable fluctuations; their terminations may remain stationary for years, and then advance or recede for a considerable period. The end of the Vernagt glacier in 1883 was more than 2,000 yards distant from the position it occupied in 1845. A study of this glacier has further shown that periodical advances have alternated with retreats, there being at least ten such alternations since the beginning of the 17th century. The underlying causes are probably slow changes of climate, for glaciers may be regarded as excellent slow-action thermometers. Brückner has endeavoured to prove that the observations since 1700 establish a cycle of about thirty-five years.

The cause of the movement of glaciers has been discussed by Croll, Thomson, Tyndall, Helmholtz, Von Drygalski, and others. It is now generally admitted that regelation is an important factor. The pressure of the accumulated snow drives the mass forward. Under pressure ice is plastic; as the pressure rises the freezing-point is lowered, the compressed ice melts till the pressure is relieved, when it again becomes solid. In this way it can adapt itself readily to the irregularities of its channel. It is also known that the ice is granular, and the grains may move on one another; and in the crystals of glacier ice there are planes along which displacement can easily take place ('glide planes'), and these greatly

facilitate change of shape in the whole mass.

Small 'hanging' glaciers which lie on the steep slopes of the sides of the valleys are the only ones that occur in the Pyrenees. The central plateau of Northern Scandinavia is ice-covered (3,000 sq. m.), and sends many large glaciers down the valleys. There are many fine glaciers in Spitzbergen. The interior of Greenland is occupied by a vast inland ice-sheet, from which glaciers flow outwards to the coast. Many glaciers are known in the Caucasus, and in the Himalayas, where they are of great size, some of them nearly one hundred miles long. In the Rocky Mountains only small glaciers are found south of the Canadian boundary, but in British Columbia and Alaska they are magnificently developed. The Malaspina glacier in Alaska presents a type (the Piedmont glaciers) which was important during the Glacial Period: in these, many valley glaciers unite to form a confluent mass on the plains at the base of the hills. In Africa small glaciers are known near the summits of Kilima-Njaro and Kenia. In the Andes of S. America glaciers are few and small, except in Patagonia and Tierra del Fuego, where some of them reach sea-level. In the New Zealand Alps there are many beautiful glaciers, the lower ends of which enter a region of subtropical forests, in which tree-forms grow luxuriantly. For glaciers generally, see Tyndall's *Forms of Water* (1872); T. G. Bonney's *Story of Our Planet* (1893); Israel Russell's *Existing Glaciers of the United States* (1885); J. D. Forbes's *Travels through the Alps* (1900), and his *Norway and its Glaciers* (1853); Tyndall's *Glaciers of the Alps* (new ed. 1896); *Peaks, Passes, and Glaciers*, by Members of the Alpine Club; Whymper's *Scrambles amongst the Alps* (1871), *Chamonix and Mont Blanc* (1896), and *Zermatt and the Matterhorn* (1897); Sir Martin Conway's *Spitsbergen* (1897); Douglas Freshfield's *Travels in the Central Caucasus* (1869); Rendu's *Theory of the Glaciers of Savoy* (1874).

Glacis, a term in fortification, meaning a smooth piece of ground, sloping upwards, and clear of all obstacles, which must be crossed in order to enter a fort, and which the defenders of the fort can sweep with musketry and artillery fire during an enemy's advance.

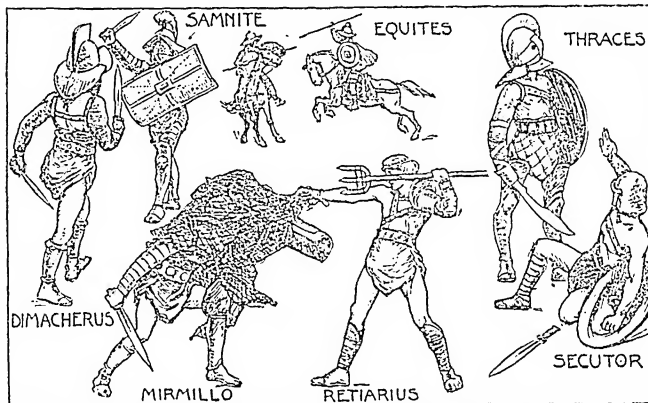
Gladbach, or BERGISCH-GLADBACH, tn., Prussian prov. of Rhineland, 9 m. by rail E. of Cologne, with iron and steel works and coal mines. Pop. (1900) 11,435.

Gladbach, or MÜNCHEN-GLADBACH, also MÖNCHEN-GLADBACH, tn., Prussian prov. of Rhineland, 16 m. by rail W. of Düsseldorf, the chief centre of the Rhenish cotton industry. It has also dye-works and calico-printing establishments, iron foundries, machinery factories, silk and woolen mills, stationery factories, breweries, etc. It derives its name from an abbey of Benedictine monks, founded here in 972, and dissolved in 1802. The minster has a Gothic choir of the 12th century and an 8th century crypt. Pop. (1900) 58,023.

Gladiator, a swordsman whose profession it was to fight for the public amusement. Gladiators are said to have been borrowed by Rome from the Etruscans. They were first exhibited in Rome in 264 B.C., primarily at funerals, but afterwards at festivals, particularly those celebrated by the ædiles and other magistrates.

desired his death, they turned them up. These combats were often attended by great cruelty and callousness on the part of the spectators; sometimes they were fights *à outrance*, none being spared alive. Discharged gladiators were presented with a *rudis*, or wooden sword, and hence were called *rudarii*. Gladiatorial combats were disliked by the Greeks, and practically never took place in Greek cities. Gérôme has a famous sculptured group of gladiators saluting the emperor, and known as *Ave, Caesar! morituri te salutant*.

Gladiolus, a genus of hardy, bulbous plants belonging to the order Iridaceæ. The flowers are borne in long spikes. The varieties are propagated by separation of the young corms from their parents, and new varieties are raised from seed sown in March. For the successful cultivation of gladioli, choose a



Gladiators: Various Types of Equipment.

More than ten thousand were shown at Trajan's triumph over the Dacians. They were either free-born citizens, usually of a low class, who fought for hire, or captives, slaves, or malefactors, and were kept in schools, where they were carefully trained. Chief varieties were *andabate*, who wore helmets with no openings for the eyes, so that their blindfold movements provoked the spectators' mirth; *mirmillones*, who used Gallic weapons, sword and shield; *retiarii*, who carried a net and a three-pronged lance—the net to entangle their opponents; and *Thraces*, who, like the Thracians, used a short sword and a round buckler. When a gladiator was severely wounded and defeated, the people cried out, '*Habet*' (He has it), and he lowered his arms; then, if the spectators wished his life to be spared, they turned their thumbs down; but if they

deeply-dug, rich, well-drained soil, and a situation sheltered from winds but exposed to sunlight. Mr. James Kelway, a great authority on gladioli, recommends that in September, or early in October, when the land is dry, it should have a liberal quantity of stable manure dug in deeply with a fork. Then allow the land to lie rough until the latter part of February or the beginning of March. It should then be hacked over at least six inches deep with a potato-hoe; when this is done, drill out the whole piece in drills eighteen inches apart and three inches deep, and mark it out into beds of four feet wide, with paths two feet in width. If the corms are very large, four in a row will be quite sufficient. Continue planting, at intervals of a fortnight, from the end of February until the 20th of May. To have them late for decorating the con-

servatory, the corms should be potted singly in 6-inch pots, about the end of May, using a rich compost of good yellow loam, old hot-bed manure, and silver sand. They should then be plunged in a bed of very rich soil. As soon as frost begins, the pots should be lifted and placed in a cold greenhouse, and brought into the conservatory as soon as the first buds begin to open.

Gladstone, seapt, Clinton co., Queensland, Commonwealth of Australia, about 328 m. N.E. of Brisbane by rail. Its harbour is deep, spacious, and well sheltered. Gold and manganese are mined, and the town has meat works. Pop. (1901) 1,622.



Herbert J. Gladstone.
(Photo by Horesford.)

Gladstone, HERBERT JOHN (1834), English politician, was born in Downing Street, London, the son of William Ewart Gladstone. Mr. Herbert Gladstone's membership of the House dates from 1830. He was then returned for Leeds, and since 1885 has represented West Leeds. He acted as junior whip in the Gladstone ministry (1881-5), and during the last year of its existence was financial secretary to the War Office (1885-6). When the Home Rule government was returned to power, he was transferred to the Home Office as under-secretary (1892-4). Lord Rosebery (March 1894) nominated him first commissioner of works. This position he retained till the defeat of the government (June 1895). In 1899 he was made chief Liberal whip, which office he exchanged in December 1905 for the post of Home Secretary in Sir Henry Campbell-Bannerman's administration.

Gladstone, JOHN HALL (1827-1902), English chemist and physicist, was born at Hackney, London. He was a friend of Faraday, of whom he wrote a *Biography* (1872). He occupied the Fullertonian chair of chemistry at the Royal Institution (1874-7); first president of the Physical Society on its foundation in 1874; a member of the Royal Commission on Lights, Buoys, and Beacons (1858-61); and served on the War Office Gun Cotton Committee (1864-8). He was interested in education, and represented Chelsea (1873-94) on the London School Board (of which he was vice-chairman). He was author of *Chemistry of Secondary Batteries* (1883).

Gladstone, WILLIAM EWART (1809-98), British statesman, was of Scottish descent, and was born in Liverpool. He was sent to Eton, and afterwards to Christ Church, Oxford. Immediately after the first Reform Bill, Gladstone received the offer of Newark from the Duke of Newcastle. The young member soon made his mark in the House, and when Sir Robert Peel assumed office (1834) Gladstone was given the post of junior lord of the Treasury, and next year he was promoted to the under-secretaryship for the colonies. During the earlier sessions of Peel's administration Gladstone stood prominently forward as the oratorical exponent of Toryism, and made a vigorous defence of the 'sliding scale' and protection generally. His first efforts were directed to the purification of the tariff. The budget of 1842 shows a new departure in national finance, the outcome of which was the total abolition of duty on 750 out of 1,200 duty-paying articles. As President of the Board of Trade (1843), Gladstone introduced a bill abolishing the law against the exportation of machinery. The propaganda of Cobden and the Irish famine having driven Peel to a policy of free trade, he rejected half-measures, and resolved to repeal the corn laws. A ministerial crisis resulted. Peel came back to power, and in the reconstructed cabinet Gladstone became Colonial Secretary (1845), but had no seat in the House of Commons. At the ensuing general election (1847) Gladstone obtained, but not without a struggle, the long coveted honour of representing his *alma mater*.

Gladstone was selected as Chancellor of the Exchequer in Lord Aberdeen's coalition ministry (1852). In 1855, when, owing to the break-up of the coalition government, Lord Palmerston was called to guide British affairs through the Crimean war, Gladstone retained his post as Chancellor of the Exchequer, but re-

signed three weeks later over a motion of inquiry in connection with the war. For some years he remained out of office, occupying his leisure with studies on *Homer and the Homeric Age*, which appeared in 1858. In 1859 Gladstone joined the ministry of Lord Palmerston, who had again come into power. In 1861 he abolished the paper duty, thus establishing a free press. In ability as a financier, and as a master of exposition, Gladstone has never been equalled. He adorned the dry details of budget speeches with the charms of oratory. In July 1865 Palmerston's Parliament came to an end; Gladstone was defeated at Oxford, and had to take refuge in South Lancashire.

On Palmerston's death in 1865, Lord John Russell was made premier, and went to the Lords, with Gladstone as leader of the House of Commons. The reform agitation which Palmerston had discouraged was now pressed forward; and in order to deal with it, Gladstone brought in a measure which, however, was defeated by the Conservatives, with the help of a number of dissatisfied Liberals called 'Adullamites.' The ministry resigned, and Lord Derby came into office (1866). The time, in Gladstone's opinion, was ripe for legislation for Ireland; and a speech, wherein he let fall the word 'disestablishment,' revealed the path along which his mind was moving. A dissolution took place at the end of July 1868. Gladstone was defeated in South Lancashire, which had found his views much too progressive, but was elected for Greenwich. The outcome of the election was that the Liberals were returned with a good working majority, which served to disestablish the Irish Church. Gladstone soon found that behind the church question lay another and more widespread grievance in Ireland—that of the land. A Land Bill (introduced Feb. 15, 1870), the fundamental feature of which was the substitution of partnership between landlord and tenant for absolute ownership, was passed in the succeeding August; and, still eager to remedy the wrongs of Ireland, Gladstone grappled with university education. On Feb. 6, 1873, he brought in a bill which was rejected by a majority of three; and Parliament was dissolved in January 1874.

On March 12, 1874, the country was startled by the announcement of Gladstone's intention to resign the leadership of the Liberal party, and to retire into private life. He threw himself into Homeric and ecclesiastical studies with the enthusiasm which characterized all his work.

He busied himself with the relation between the Church of Rome and modern secular life, and concluded that the doctrines of Romanism were incompatible with loyalty to the sovereign (cf. his pamphlet, *The Vatican Decrees*, 1875). After the 'Bulgarian atrocities,' Gladstone wrote a pamphlet, *Bulgarian Horrors and the Question of the East* (1876), and addressed large meetings all over the country, in which he denounced with all his old fervour our blundering policy of bloodshed—an oratorical campaign which was ridiculed by Disraeli as a 'pilgrimage of passion.' At the request of the Liberals of Midlothian, Gladstone offered himself as a candidate against Lord Dalkeith. During his campaign he attacked the Conservative government with great vigour, the result of which became apparent when the dissolution took place (March 24, 1880). Gladstone was returned for Midlothian, and all over the country the Liberals were victorious.

Gladstone was, of course, compelled to resume his old position as leader. He had not been long in office when Irish affairs urgently demanded attention. Gladstone's Land Act had done good, but it was by no means a final measure, and evictions had steadily increased under it. In order to obviate these difficulties, Forster, Chief Secretary for Ireland, brought in a Compensation for Disturbances Bill; but this, though passed by the Commons, was rejected by the Lords. The result was great dissatisfaction in Ireland, leading to the passing of a Coercion Act. Gladstone, however, did not stop there, but introduced a measure to deal with the whole land question on the basis of the 'three F's'—fair rent, fixity of tenure, and free sale (April 1881). Forster meantime was busily engaged endeavouring to put down the Land League in Ireland, while Gladstone at Leeds (Oct. 1881) attacked Parnell as 'marching through rapine to the dismemberment of the empire.' On October 13 all the prominent Land League leaders were arrested, Parnell among the number. In foreign policy the government suffered severely in consequence of the turn which events took in Africa, and public feeling was especially excited over the tragic death of General Gordon at Khartum. The government were blamed for delay in sending a force to his rescue, and the ministry, defeated in 1885 on a budget proposal, gave place to the Conservatives.

In 1886 Gladstone came back to power with the determination

to have done with repressive measures in dealing with Ireland, and to conciliate the Nationalist aspirations of the people. He produced two bills, the one dealing with land purchase, the other providing for the establishment of a statutory Parliament in Dublin for the discharge of Irish business, reserving in the hands of the imperial Parliament matters of imperial interest. These bills led to a split in the Liberal party. On a division, the Home Rule Bill was defeated, and an appeal made to the country. Aided by the Liberal Unionists, the Conservatives were returned to power, pledged to maintain the supremacy of Parliament. On June 28, 1892, the Salisbury Parliament was dissolved, and once again Gladstone found himself in office with a majority of forty. Another Home Rule Bill was introduced, with an important alteration. The Irish members were to be retained at Westminster at the reduced number of eighty, but were to be excluded from voting on any bill directly affecting Great Britain. The measure passed the Commons by 347 votes against 304, but was rejected in the Lords by 419 against 41. After that Gladstone took a short holiday at Biarritz, and on his return delivered (March 1, 1894) a strong speech in the Commons against the House of Lords, which proved to be the last speech in the House of the greatest parliamentarian of the Victorian era. On March 3, 1894, Gladstone resigned the leadership of the party, and spent the remaining years of his life in retirement among his books, only once coming before the public, when he delivered a great speech in Liverpool on the subject of the Armenian massacres (1896).

The apparent inconsistencies of Gladstone's career arose from the fact that he was Conservative in sentiment but Liberal in opinion. In the early part of his life he was the hope of the 'stern, unbending Tories'; but the moment he came under the influence of Sir Robert Peel's financial genius, he was intellectually committed to Liberalism. His acceptance of free trade made a return to Conservatism impossible. Economic liberalism led to political liberalism. To Gladstone the middle and working classes are greatly indebted for the prosperity they now enjoy. See John Morley's *Life of Gladstone* (3 vols. 1903), *Life* by Herbert Paul (1901), G. Barnett Smith's *Life of Gladstone* (1879), and Lucy's *Diary of Two Parliaments*, and *Mr. Gladstone: a Study from Life* (1896).

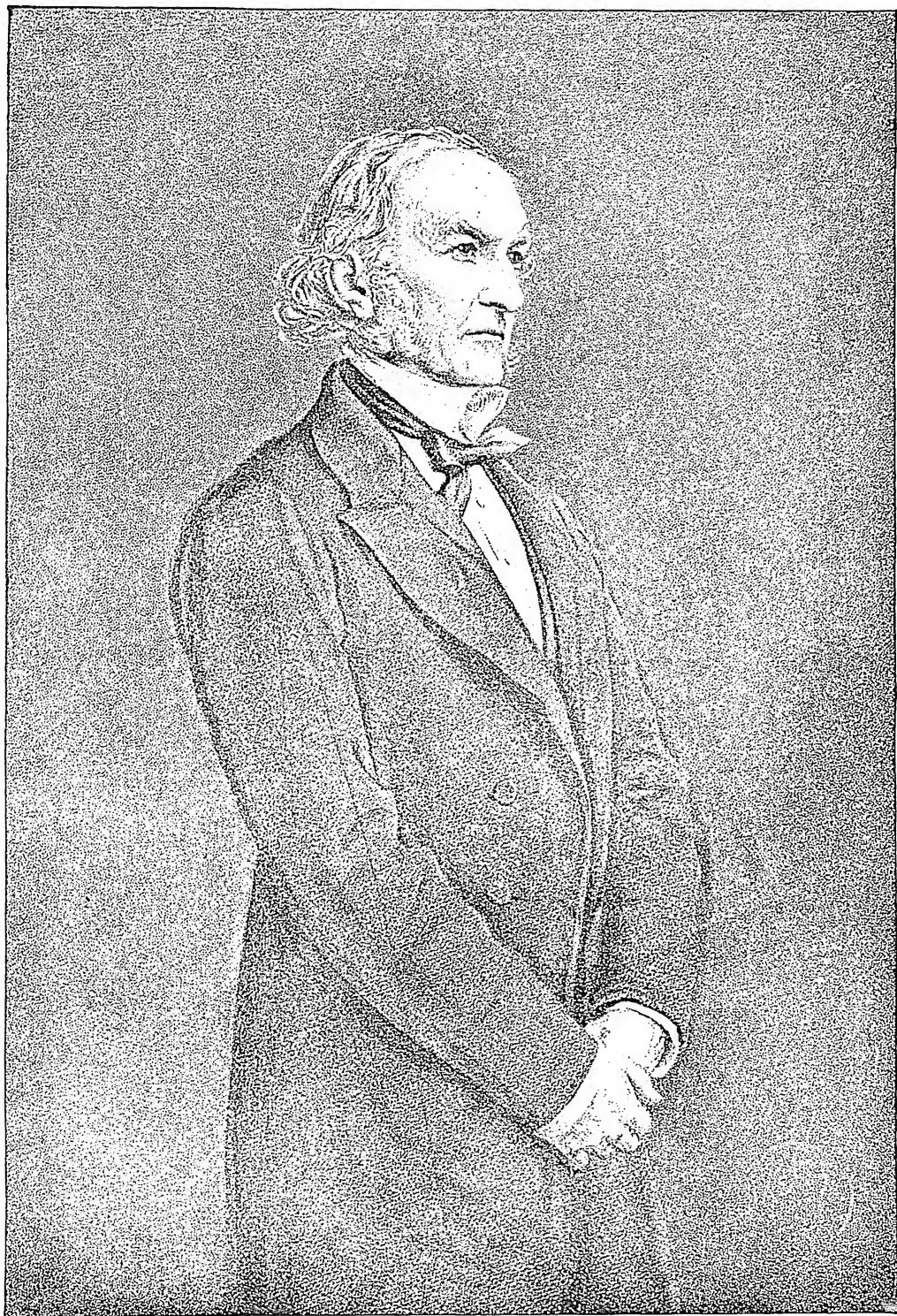
Gladwyn, a name given to *Iris fatidissima*, a British species

common in the south-west of England. The flowers are of a dingy lilac colour, but the seeds are bright coral red.

Glaisher, JAMES (1809-1903), English meteorologist, was born in London. After working on the Irish Ordnance Survey and at Cambridge Observatory, he entered the Greenwich Observatory in 1835, where he was superintendent (1841-74) of the magnetic and meteorological department. Founder of the Meteorological Society, he conducted extensive investigations on the humidity, etc., of the air, making many balloon ascents for the purpose (1862-6), reaching in one of these (Sept. 5, 1862) the unprecedented height of seven miles. He was the author of *Meteorology of England* (1860); *Scientific Experiments in Balloons* (1863); *Hygrometric Tables* (8th ed. 1893); *Travels in the Air* (1870); *Crystals of Snow* (1872); and published *The World of Comets* (1876; trans. from the French of Guillemin).

Glamis, vil. and par., Forfarshire, Scotland, 12 m. N. of Dundee. In the parish is Glamis Castle, the seat of the Earl of Strathmore. Shakespeare associates the thanage of Glamis with Macbeth by the murder of Malcolm II. in the castle (1034); but historically the castle is not mentioned until two hundred and thirty years later. Pop. (1901) 1,351.

Glamorgan, the most southerly co. of Wales. Its area is 516,959 ac. The wild and rugged country in the N. gives rise to the Taff, Ely, Neath, Tawe, etc., which drain towards the Bristol Channel. Between the mountains and the channel is an extensive and highly-fertile plain. The vale of Glamorgan is commonly known as the 'Garden of Wales.' The coal and iron industries are responsible for the rapid increase of the population of the county from 70,900 in 1801 to 859,931 in 1901. Coal is mined at Merthyr-Tydfil, Aberdare, Pontypridd, Rhymney Valley, Neath Valley, Rhondda Valley, etc.; and at Cardiff, Swansea, Aberavon, Dowlais, Briton Ferry, Port Talbot, Llandore, etc., blast furnaces are abundant. Swansea, Neath, and Aberavon engage largely in copper, tin, and lead smelting. There are also tin and zinc plate and nickel manufactures. Barry, Swansea, Port Talbot, and Cardiff are important seaports. Cardiff is the seat of the University College of S. Wales. The county is divided into five parliamentary divisions. In addition, Swansea and Cardiff county boroughs have each one member, the Swansea district one, and the Merthyr district another. Cardiff is the chief town.



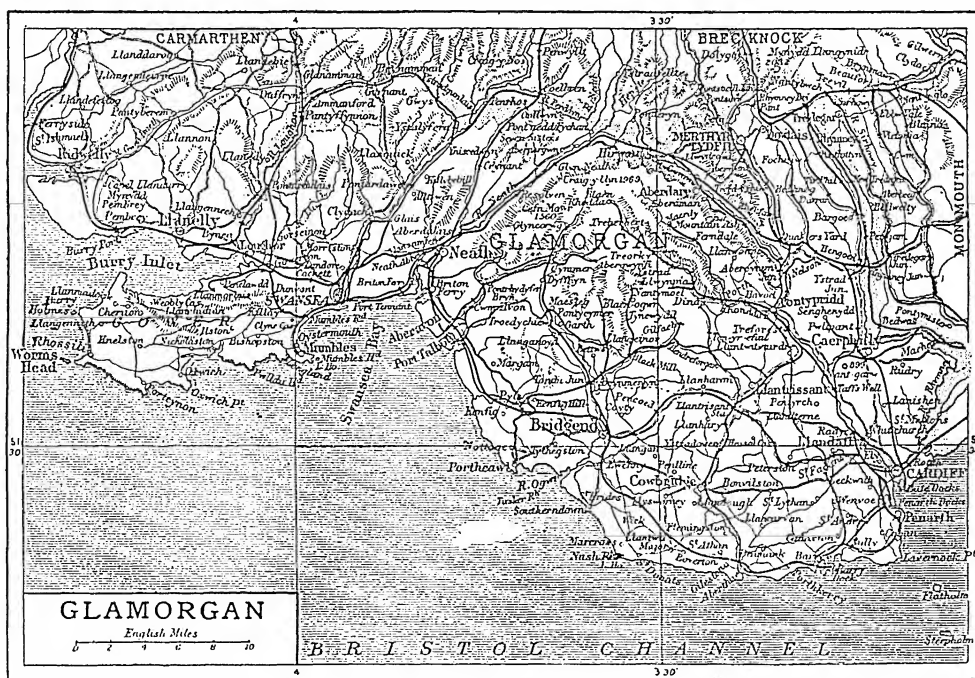
*The Rt. Hon. William Ewart Gladstone. From the painting by Sir J. E. Millais, P.R.A.
(By permission of Messrs. Agnew.)*

Glamour appears to have at one time denoted, especially in Scotland, the subtle influence described in modern days as 'mesmerism,' 'hypnotism,' and 'suggestion.' The faculty of exercising glamour was a notable attribute of the gypsies. Sir Walter Scott states that this power was possessed by 'a particular sect of mathematicians,' so called by Saxo Grammaticus; and also that 'Merlin, the son of Ambrose, was particularly skilled in this art, and displays it often in the old metrical romance of *Arthur and Merlin*.' And he adds that 'the jongleurs were also great professors of this mystery, which has in some de-

PbS; silver glance (argentite), Ag₂S; copper glance (redruthite), Cu₂S; antimony glance (stibnite), Sb₂S₃; bismuth glance (bismuthine), Bi₂S₃; cobalt glance (cobaltine), CoS₂ + CoAs₂; manganese glance (manganblende), MnS; antimon-nickel glance (tullmanite), NiS₂. NiSb₄; nickel glance (gersdorffite), NiS₂ + NiAs₂; and gold glance (sylvanite), (AuAg)₂Te₃. Specular iron, also, is sometimes called iron glance.

Glanders. Man may contract glanders by contact with animals, usually by inoculation of a skin abrasion. The disease is capable of transmission from man to man, and at least one case is known of a washerwoman having

nodule may be seen, or, at a later stage, the ulcer which takes its place. Generally there is great swelling of the nose, which may assume an erysipelatous type; and on the face and around the joints papules appear, which become pustular, so that they produce an appearance somewhat similar to smallpox. In many cases a subacute form of pneumonia supervenes from invasion of the lungs by the granulomata. This form of the disease is invariably fatal in from eight to ten days. The chronic form is less serious, being more like a severe chronic coryza with occasional laryngeal symptoms. The patient may live for months or



gree descended, with their name, on the modern jugglers; in illustration of which he refers to passages in Chaucer, in Mandeville's *Travels*, and in the *Story of Valentine and Orson* (1631). Similar testimony is afforded by Ibn Batuta, an Arab traveller of the 14th century, who describes how, when in China, he witnessed the performance—said to be still enacted in India and among the wild tribes of the Sudan—of a juggler sending a boy up an imaginary rope ladder. See HYPNOTISM, JONGLEURS.

Glance (Ger. *glanz*), a term applied to a number of minerals possessing metallic lustre. The chief are lead glance (galena),

been infected by contaminated clothing. As in the case of the lower animals, the disease may be localized in the nose, the condition then being known as glanders, whereas in farcy the virus finds a lodgment beneath the skin. The etiological factor in both conditions is the *Bacillus mallei*, a non-motile organism with rounded ends, and in size and appearance not unlike tubercle bacillus. Acute glanders has in man a period of inoculation of about three days, and its onset is marked by great febrile disturbance, with redness, swelling, and muco-purulent discharge from the nostril. Should the original site be visible, the characteristic

even years, and recovery is possible. Acute farcy also exhibits intense febrile disturbance with its concomitant train of symptoms, such as headache, rigors, sweats, rapid pulse, and vomiting. Similarly there is marked local reaction, and the lymphatics are early affected. Subcutaneous nodules, the 'farcy-buds,' appear, break down, and are succeeded by abscesses, which may form in the muscles also. Pain in the joints is a prominent symptom, and the disease often runs a course like an acute septicemia. The nostrils are not usually involved. A fatal termination generally ensues in from twelve to fifteen days. In chronic farcy

the tumours are localized as a rule, and are often situated in the extremities. In some cases abscesses form, in others ulcers with but slight inflammation or lymphatic involvement. Death, however, may supervene from pyæmia or from an attack of acute glanders. Treatment in acute cases is of little avail; but when seen early, the nodules should be destroyed by excision or by thorough cautery, followed by the application of antiseptics. Farcy-buds should be opened early. See also HORSES, Diseases of.

Glands, in anatomy, a term originally applied to such bean-like structures as occur all over the body in connection with the lymphatic system; but the meaning has now been extended to embrace any group of secretory cells. Such structures separate from the blood the characteristic constituents of their various secretions, and in most cases they are arranged in the form of small sacs, with contracted necks or ducts, through which the secretions are poured. Some glands, however, such as the thyroid and the suprarenals, are ductless, and their elaborated products must be absorbed by the blood or by the lymph, for which reason they are sometimes called vascular. The liver is the largest glandular organ in the body, and weighs nearly four pounds. On the other hand, the peptic glands of the stomach are of microscopic dimensions, and consist of simple tubular recesses lined by a secreting cellular membrane, around which the blood circulates. The salivary, gastric, and intestinal glands secrete the various fluids necessary for the digestion of food; while the kidneys and sweat glands are excretory, and pass waste products out of the circulation. Adenalgia and adenitis are terms applied to pathological conditions of the glands—e.g. pain and inflammation in them. The functions of the ductless or blood glands are imperfectly understood, but the thyroid secretion has a profound influence on the nutrition of the nervous system, while the spleen and lymphatics are largely concerned with the production of the cellular elements of the blood. Of late years extracts of various glandular tissues have been administered in cases of illness which appear to depend on defective gland secretion. The treatment has been a brilliant success in myxœdema and in cretinism, which result from disease of the thyroid gland.

Glanvill, JOSEPH (1836–80), English philosopher and divine, born at Plymouth; became rector of Wimbish in Essex (1860), and of

the Abbey Church at Bath (1866); chaplain-in-ordinary to Charles II. (1672), and prebendary of Worcester (1678). Glanvill was extremely sceptical, and strongly opposed to the Aristotelian school. His chief work is *The Vanity of Dogmatizing* (1661), reissued in revised form in 1665, under the title of *Sceptis Scientifica*. In spite of his philosophical scepticism, he was a firm believer in witchcraft, as appears from his *Philosophical Considerations touching Witches and Witchcraft* (1666).

Glanvill, RANULF DE (c. 1130–90), chief-justiciar of England, born at Stratford-in-Suffolk, near Saxmundham. While sheriff of Yorkshire, he, on July 11, 1174, at the head of the Yorkshire barons, surprised and defeated the Scottish troops at Alnwick, taking their king (William the Lion) prisoner. He was the author of *Tractatus de Legibus et Consuetudinibus Regni Angliæ* (see ed. by Sir Travers Twiss, 1890). Late in life he accompanied Richard I. to Palestine, and died at Acre.

Glanville, BARTHOLOMEUS DE (fl. 1230–50), Minorite friar. Tradition identifies him with Bartholomæus Anglicus, or that Englishman who joined the French Minorites, taught theology with marked success in Paris, and was sent to Saxony in answer to the request of the Franciscans there for his assistance (1231). Bartholomæus was the author of a book, *De Proprietatibus Rerum*, which was famous in the middle ages, especially in the English translation of Trevisa (1398).

Glaphorne, HENRY (fl. 1639), English dramatist, was a friend of Lovelace and of Thomas Bee-dome, whose poems he edited in 1641. Among his plays are *Argalus and Parthenia* (1639), *Albertus Wallenstein* (1640), *The Hollander* (1640), *Wit in a Constable* (1640), and *The Parasite, or Revenge for Honour* (1653). His poem *Whitehall* (1643) is dedicated to Lovelace. See *Memoir in Glaphorne's Plays and Poems* (1874).

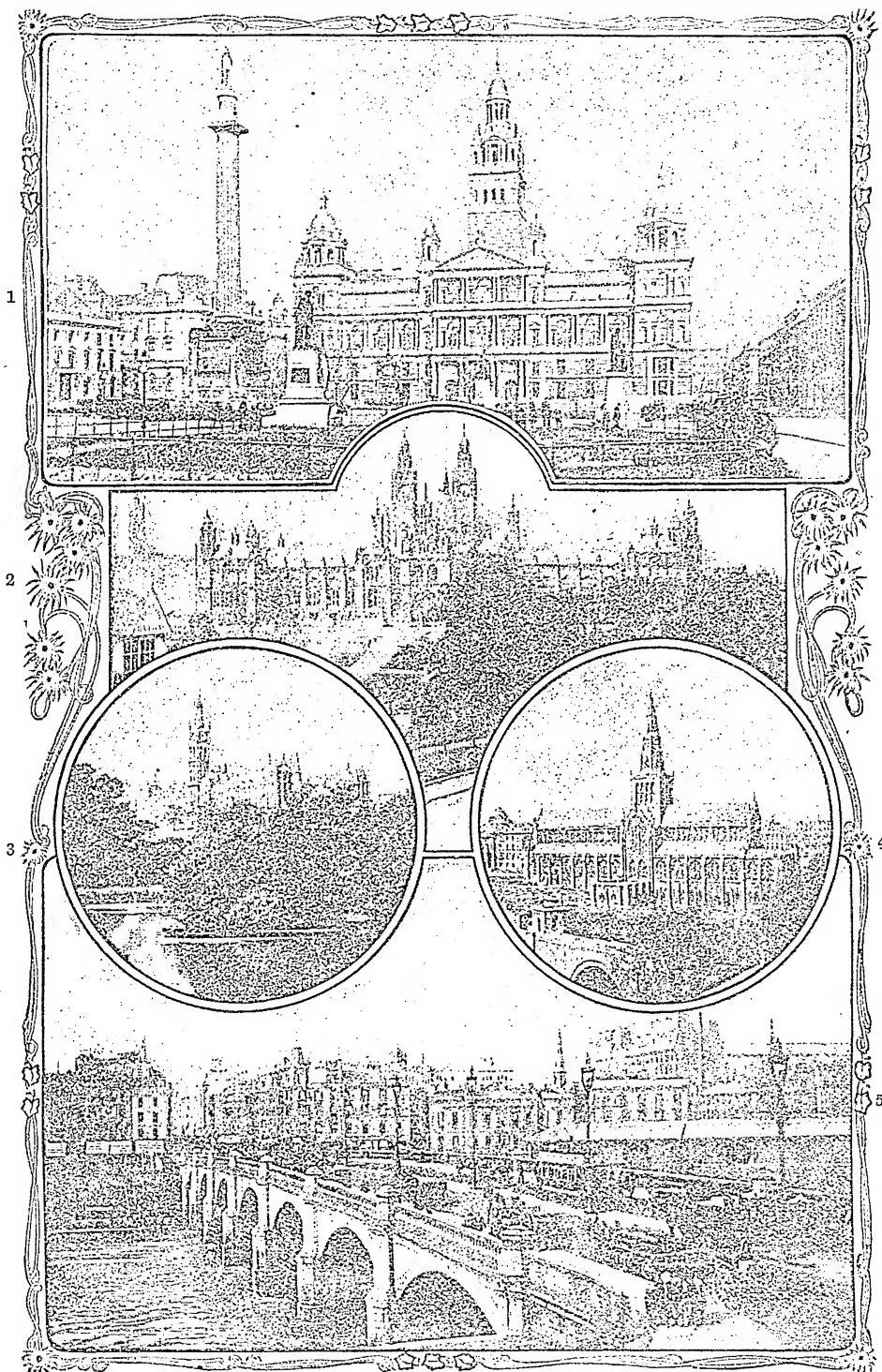
Glareanus, HEINRICUS (1488–1563), whose real name was Heinrich Loriti, Swiss humanist, native of the canton of Glarus, taught (1514–29) philosophy at Basel, subsequently at Freiburg-im-Breisgau. In 1512 he was made poet laureate by the Emperor Maximilian I. Among his friends were Erasmus and Zwingli. His works include *Dodekachordon* (1547; Ger. trans. 1883–90), a very celebrated work in its day; *Isagoge in Musicen* (1516); *De Geographia Liber* (1527); *Chronologia in omnes Livi Decadas* (1531); and critical editions of the classics, especially Livy. See Fritzsche's *Glarean, sein Leben und seine Schriften* (1890).

Glärnisch, a fine rocky mass (highest point 9,580 ft.) s.w. of the Swiss town of Glarus. For its very remarkable geological features, see the monograph by A. Baltzer (1884).

Glarus. (1.) Canton of Switzerland, comprises the basin of the Linth, rising in the snows of the Tödi (11,887 ft.). Its area is 267 sq. m. Its population is mainly German-speaking, and numbered 32,349 in 1900. Its chief industries are cotton and linen manufactures. (2.) Capital of above canton, on the Linth, with cotton and linen mills. Pop. (1900) 4,877.

Glas, or GLASS, JOHN (1695–1773), Scottish divine and founder of the Glassite sect, was born at Auchtermuchty in Fifeshire, and was ordained to the parish of Tealing in Forfarshire in 1719. There he formed the Glassite sect (see GLASSITES), which, in its relation to church government, renounced Presbyterianism for Independency. Glas was finally deposed from the ministry (1730); but in 1739 he was restored by the General Assembly to the position of 'a minister of Jesus Christ,' though not to that of 'a minister of the Kirk of Scotland.' A collected edition of his works, of which the chief is *The Testimony of the King of Martyrs concerning his Kingdom* (1727), was published in 1782–3.

Glasgow, a royal bur., city, and co. of a city, on the Clyde, Scotland, 42½ m. w. by s. of Edinburgh. It disputes with Liverpool the second place among the cities of the British empire for size and population. On the N. bk. of the river the city is built upon a number of hills, from 100 to 250 ft. high; the S. portion is almost flat. Described by Defoe in 1723 as 'the beautifullest little city I have seen in Britain,' it is now a dense mass of all too narrow streets, flanked by tall buildings, many of which have fine architectural features which are ill displayed; and is overhung by a pall of smoke from the chimneys of the manufacturing factories to which it owes its extraordinary growth during the 19th century. In modern times the old town has been largely remodelled on a fairly regular plan, and there is no apparent breach between the old town and the more open suburbs which stretch out to the west and south. In the beginning of the 17th century the city was 1½ m. in length by ¾ m. in breadth; now, including detached suburbs, it covers an area 9½ m. by 5½ m., and the acreage of the city proper, with the contiguous burghs of Govan, Partick, and Kinning Park, which still preserve their municipal independence, is 15,659,



Views in Glasgow.

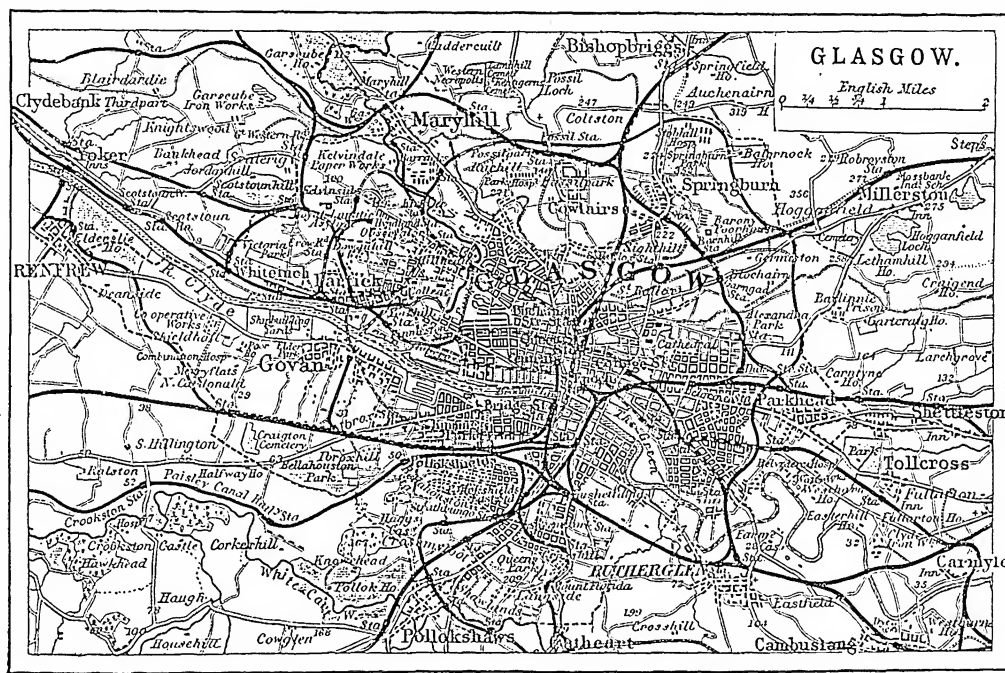
1. Municipal Buildings, George Square. 2. Art Gallery. 3. University. 4. St. Mungo's Cathedral. (Photos by Valentine.)
5. Broomielaw Bridge. (Photo by G. W. Wilson & Co.)

Modern Glasgow is divided into a large number of parishes, of which the principal are Barony (the largest and most populous in Scotland), City, and Govan parishes. The most important public building is the cathedral, an Early English structure (containing a small part of a previous cathedral consecrated in 1197). It was commenced about 1238, and is now almost in the same state as at the reformation, when, though stripped of its ornaments, it was saved by the citizens from the fury of the mob. The first permanent home of the professors and students of the university was on a site south-west of the cathedral, now occupied by the

grove Park, completed in 1901; a people's palace in Glasgow Green; and the Y.M.C.A. buildings.

Founded, according to tradition, by the establishment of a church on the site of the cathedral by St. Ninian in the 4th century, the village was made a burgh of barony in 1180 by William the Lion, Prince David having 'restored' the see of Glasgow in 1115. Until the reformation the burgh depended for its existence mainly upon the cathedral, which was its nucleus. In 1242 the burgesses and men of the bishop became as free to trade in Lennox and Argyll as the men of Dumbarton. In 1450 James

National Covenant was signed by 2,250 persons in Glasgow in 1581, and an exceptionally despotic kirk-session ruled the people with a rod of iron. Glasgow was the meeting-place of the General Assembly of 1638, which abolished Episcopacy; and while it was alternately the spoil of the two contending parties in the civil war, it was one of the burghs which refused to send its quota of armed men for the defence of the king's person. It offered a hasty and premature welcome to the restoration, and erected a monument to the Covenanters who were hanged in the city after Bothwell Brig. The provost was one of the commis-



College railway station, and this was not abandoned till the fourth decade of the 19th century, when (1870-84) the university was rebuilt on Gilmorehill, about two miles to the north-west, after an Early English design, with later Scots-Flemish features, by Sir Gilbert Scott. New municipal buildings (officially designated the City Chambers), in the style of the Italian Renaissance, were erected in George Square in 1883-89. Other notable public buildings are the Royal Infirmary and the Western and Victoria infirmaries; the Belvedere and Ruchill hospitals for infectious diseases, the latter of which cost half a million in 1900; the city art galleries (Spanish Renaissance) in Kelvin-

II. made Glasgow a burgh of regality, and in the same year the university was founded by a bull of Pope Nicholas V. At the reformation Glasgow stood eleventh in the roll of Scottish burghs, and had a population of about 4,500. Prior to the reformation the history of Glasgow is the history of the see, and the most prominent fact in it is that Bishop Wishart, in the 13th century, took an active part with Wallace and Bruce in the wars of independence. Within the present municipal bounds were fought the battle of the Butts, during the minority of Queen Mary, and the battle of Langside, which consigned her to imprisonment and death in England. The

sioners for the parliamentary union, but Glasgow resisted that measure even to rebellion. In the '15' Glasgow raised a regiment of 600 men for the Hanoverian king, bearing the whole expense, and dug trenches about the city. Ten years later it was disgraced by a riot, arising from the first imposition of a malt tax. In the '45' the Chevalier quartered upon it a clan of Highlanders, who had to be bought off with a large sum; and after the retreat from Derby he descended upon the city and dwelt there for ten days, compelling the people to feed and clothe his ragged host. The most notable incidents in the later history of the city are a number of riots,

of which the most serious was a 'meal row' of 1848, when six persons were shot by the soldiers; the failure of the Western Bank in 1857, and of the City of Glasgow Bank in 1878; outrages by Irish dynamitards in 1883; and the International Exhibitions of 1888 and 1901.

The Union opened to Glasgow the American trade, and the shipping grew from 1,182 tons in 1692 to 60,000 tons in 1771. It was in this city that Watt conceived the steam-engine; on the Forth and Clyde Canal Symington ran the first steamboat in 1801; and ten years later Henry Bell built the s.s. *Comet*, which plied between Glasgow and Helensburgh. In 1840 the Messrs. Burns sent the *Sirius*, the first Cunarder, across the Atlantic. The direct Indian trade was opened in 1816. Now the tonnage registered at the port exceeds a million and a half, and the annual imports and exports twenty-five millions sterling. During the 19th century the Clyde between Glasgow and the estuary has been transformed from a shallow stream into a navigable channel with a minimum depth of 22 ft.; and the completion of the most modern of Glasgow docks (Prince's, 72 ac.) increased the area of the harbour to 200 ac. Glasgow started very early with the manufacture of woollens, and acquired a fame for its plaids. In the 18th century were added muslin-weaving, distilling, inkle-making (of which the secret was stolen from Holland for Glasgow), tobacco, shalloons, cotton, leather, and furniture. The first cotton mill was erected in 1792, and this material now occupies the greater part of the textile factories in the city; there are also numerous calico-printing and bleaching works. Linen comes next in importance. The iron trade, introduced in 1732, is now the dominant one in Glasgow. The city contains blast-furnaces, iron and steel works and forges, engineers' and boiler-makers' shops. The manufactures of chemicals, leather, clothing, whisky, furniture, and timber are of the first importance. Shipbuilding is a leading industry at Clyde ports, the annual output aggregating half a million tons. Imports (1905), £14,294,421; exports, £23,997,341.

The city is represented by seven members. The municipal government was subordinate to the church till long after the reformation, and it was only in 1690 that the city received from the crown the right to elect its own town council, which now numbers seventy-seven members, with a lord provost (so entitled, with the prefix honourable since 1688) and fifteen bailies. Since

1893, as a county, Glasgow has had its own lord-lieutenant and licensing appeal courts. The town council supplies gas, water, hydraulic power, electric light and power, maintains a telephone exchange, and works street tramways, and is noted for its able administration and its enterprise and tendency towards municipal socialism. The water supply comes from Loch Katrine.

In 1866 a municipal Improvement Trust was constituted, and by its agency, assisted by the corporation, the death-rate has been reduced from 30-33 to 20-23; the worst parts of the town have been rebuilt and opened out by the making of new streets. Model lodging-houses for men and women have also been erected. Vast sewerage works are being constructed to intercept the sewage of Glasgow and its neighbours from the Clyde and Kelvin, and treat it by precipitation; the valuable residuum of the city refuse is utilized on three corporation farms. The corporation maintains sixteen public parks, covering in all more than 1,000 ac., besides the Argyllshire estate of Ardinglass (9,000 acres), presented in 1905 by Mr. A. Cameron Corbett, M.P.; also libraries, art galleries, and museums.

In 1904-5 the liabilities of the city amounted to £3,363,831, and the assets to £3,792,078, showing a free surplus of £428,247, exclusive of the sinking fund on tramways account, now £440,274. The Clyde Trust, which manages the harbour, carries a debt of five and three-quarter millions, and has a revenue approaching half a million. There are two parish councils. The three leading Scottish railway companies run into the city, there are two circular suburban railways, and a cable subway encircles the western town.

The university has forty-one professors and more than thirty lecturers and assistants, and, including women, the average number of students annually is about 2,000. Queen Margaret College, founded and endowed in 1883 for the higher education of women, was incorporated in the university ten years later. Anderson's College, an academical institution founded in 1796, was divided by the Educational Endowments Commissioners in 1886, and its medical classes were incorporated in Anderson's College Medical School, while its arts faculty was combined with several other independent science schools to form the Glasgow and West of Scotland Technical College, which has thirty-one professors and lecturers, and an attendance (1903-4) of 4,683 day and evening students. The West of Scotland

Agricultural College was instituted at the end of the 19th century. St. Mungo's College (1889) has a medical school in connection with the Royal Infirmary—the university and Anderson's College are associated with the Western—and has also a fully-staffed faculty of law. The United Free Church maintains a theological college in the city, and there are teachers' training colleges in connection with that church, the Church of Scotland, and the Roman Catholic Church. Glasgow is the seat of an Episcopalian bishopric and of a Roman Catholic archbishopric, and there is a huge Roman Catholic (Irish) population. In 1860 the population of Glasgow amounted to 14,678, in 1801 to 77,385, in 1851 to 329,096, and in 1901 to 761,709. See Cleland's *Annals of Glasgow* (1816); Marwick's *Extracts from Burgh Records and Charters relating to Glasgow* (1869-71); A. Macgeorge's *Old Glasgow* (1888); Bell and Paton's *Glasgow, its Municipal Organization*, etc. (1896); Sir D. Richmond's *Notes on Municipal Work* (1896); J. H. Muir's *Glasgow in 1901* (1901).

Glasgow Herald, THE, was founded in 1779, and first appeared as a weekly under the title of the *Glasgow Advertiser*. In 1782 its name was changed to the *Glasgow Advertiser and Herald*, and a little later it appeared as the *Glasgow Herald* simply. During the first half of the last century the *Herald* was published twice a week—on Mondays and Fridays. Then its publication was increased to three times a week; but it was not until after the repeal of the newspaper stamp duty in 1835 that the *Herald* began to acquire the importance which it possesses today. In 1838 the daily issue was begun and the price reduced to a penny, and from that time the *Herald* has occupied a leading position among British newspapers. Its first editor of note was Mr. Hunter, who also owned the paper, and who in the middle of the 19th century was a considerable personality in Scottish political life. In 1887 Dr. Charles Gilchrist Russell succeeded in the editorial chair, and still holds the position. With Dr. Russell is associated Dr. William Wallace, author of the *Life of Burns* (1896). The *Herald* has always been Liberal in politics; but on the Home Rule split of 1886 it espoused the Liberal Unionist cause. To Mr. Chamberlain's scheme of fiscal reform, first expounded in 1903, the *Herald* has offered an uncompromising resistance. In 1906 it inaugurated a branch of the *Times* book club for Scotland. **Glasnevin**. See DUBLIN.

Glass is a non-crystalline mixture of silicates, usually of calcium or lead, with those of potassium or sodium, that has been fused in preparation. In the Egyptian, Greek, and Phœnician periods the manufacture of glass was carried on with a degree of technical perfection and artistic

system of preparing glass is the old Venetian method, in which the materials are fused in open pots or crucibles set in a circular furnace with a dome. This system, with more or less considerable modifications of the furnace, is still much used, especially in France and Belgium, for the pro-

duction of window glass and coarse bottles. The air usually enters the circular furnace by an underground tunnel, which also serves as an ashpit. Round the furnace there may be eight openings, one or two of these being for feeding in the fuel, and six or seven for working the

glass. The dome or arch of fire-bricks, built so as to cover the pots and reverberate the heat downwards, is an important and essential element. There is good reason for conjecturing that the glass-furnaces of ancient times did not differ very much from the Venetian furnace. Those kinds of glass which contain a large proportion of lead oxide (flint glass) cannot be made or melted in open pots, as the furnace gases would reduce some of the lead to the metallic state and discolour the glass. Similarly it is necessary to protect certain fine coloured glasses, and glasses intended for optical purposes, from the furnace dust and gases. The method adopted is to use a melting pot shaped as shown, the contracted mouth being turned towards one of the openings in the circular furnace. The most perfect modern furnaces are fed with 'producer gas' heated by 'regenerators'—a system which gives the utmost cleanliness and the most complete control of the heat.

'Tank' furnaces are employed for making the cheaper kinds of window and bottle glass, and consist of large fire-clay tanks, heated by producer gas, in which the glass is melted, and containing partitions under which the glass has to flow to separate it from surface impurities or 'glass gall.'

Hard Bohemian Glass.—Clean sand, 100; potassium carbonate, 35; limestone or chalk, 15.

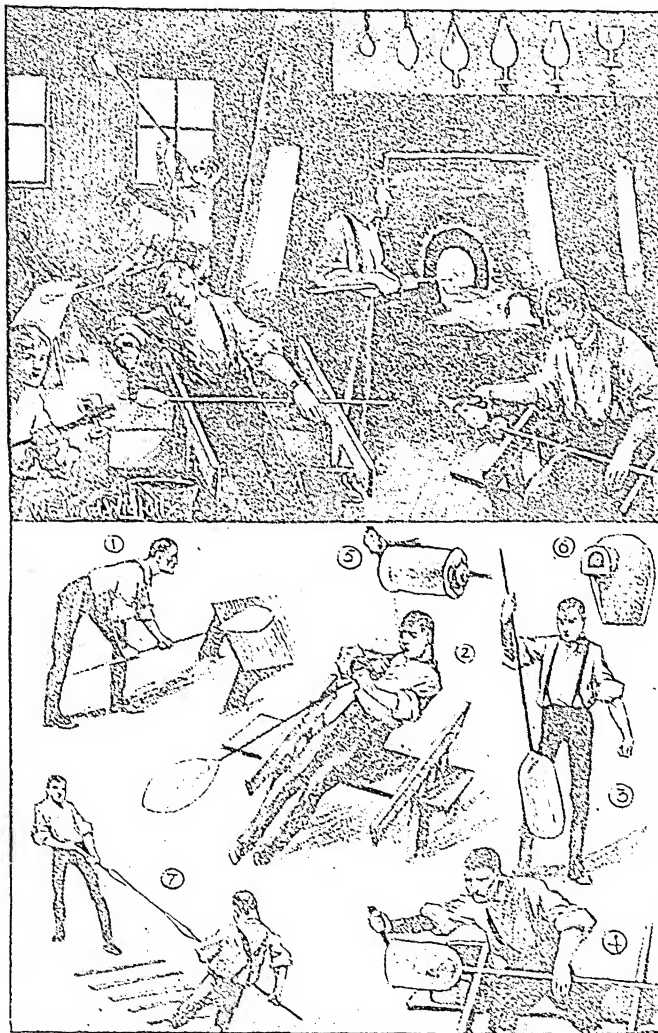
Bottle Glasses.—A fine greenish glass may be made from sand 100, limestone or chalk 35, dry sodium carbonate 17 to 25. The coarser bottle glasses are made up by adding more or less of marl, clay, barium sulphate or basaltic rock to the mixture. Indeed, in some cases a black glass suitable for beer bottles has been made by simply melting a basaltic rock, or a mixture of basaltic rock and wood ashes.

Sheet Glass, Plate Glass, and Crown Glass.—A cheap glass is made of such a mixture as the following: sand, 100; limestone or chalk, 36; sodium sulphate, 36; broken glass or cullet, 30 to 100.

Flint Glass.—Sand, 100; red lead, 80; potassium carbonate, 33; nitre, 5.

Special Optical Glasses.—Until about 1880 scarcely any glasses other than carefully prepared flint and crown were used in making optical lenses, but since then a new industry has arisen at Jena, in which special glasses for optical, thermometric, and other uses are prepared.

Coloured Glasses.—Various metallic oxides and compounds will colour glass if fused with



The Processes of Glass Manufacture.

1-5. Making flint glass for windows. 6. Melting-pot for flint glass. 7. Making glass tubing. (Sketches at Messrs. Penick's glass works, Blackfriars.)

elegance that has since been scarcely rivalled, and is not now excelled.

Manufacture: Furnaces.—Ordinary glasses have silica, generally in the form of clean-washed sand, as a basis, which is fused with alkalis and alkaline earths or oxide of lead. The simplest

duction of window glass and coarse bottles. The air usually enters the circular furnace by an underground tunnel, which also serves as an ashpit. Round the furnace there may be eight openings, one or two of these being for feeding in the fuel, and six or seven for working the

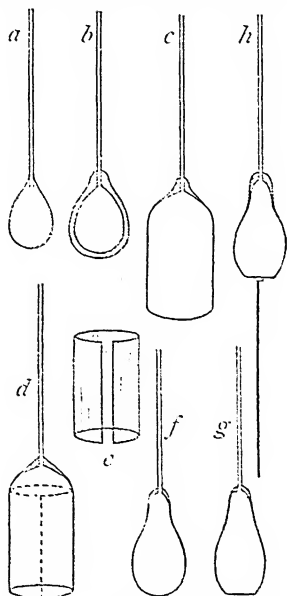
the materials which, to produce the best results, have as a rule to be under delicately balanced conditions of oxidation or reduction. Red, by copper in the sub-oxidized state, or gold; yellow, by silver, iron in the ferric state, or antimony; blue, by cobalt; amethyst, by manganese; green, by copper as cupric oxide, or by sesquioxide of chromium; neutral or smoke tints, by platinum or iridium; also the deeper blacks by the use of mixtures of colours which practically cut out all tints of the spectrum—*e.g.* manganese, copper, and iron, or even manganese and iron alone—the black glass beer bottles being an illustration.

Melting and Refining.—It is usual to mix well the crushed materials and to put the mixture into the hot crucible or pot, more being added as the mixture fuses. The temperature is raised to the utmost, and the now very fluid glass is stirred. After a period of rest the glass becomes fined, as bubbles and the impurities rise to the surface; so that when skimmed the fined glass is ready for pouring or casting, but for ordinary uses it is too fluid.

Pouring or Casting.—Plate glass is made by pouring the melted glass on a large level table, the surface of which is of cast iron or ganister. A roller is used to assist in spreading the glass, and gauge edges on the table determine the thickness of the plate. When annealed, the plate is ground down as subsequently described.

Blowing and Stretching.—A piece of plain iron pipe (blow-pipe), the end of which has been repeatedly dipped in the soft glass until a mass is gathered thereon, is shown at *a*. This mass is rolled on an iron slab and expanded (*b*) by blowing down the pipe. By rolling on the slab, reheating at the mouth of the furnace, reblowing, and allowing the soft mass to hang downwards, the sphere can be stretched to a cylinder (*c*). The end of this cylinder being held to the mouth of the furnace, and the tube being closed by the hand, the softened glass will burst by the pressure of the expanding air inside, giving *d*. A piece of wet iron is next drawn round the cylinder at the blowpipe end, and again along the cylinder in the direction of its length, as indicated by the dotted lines in *d*. A crack follows the wet iron, and the detached cylinder opens a little at the long crack (*e*). A slight reheating, and opening out in a flattening kiln, serves to convert the split cylinder into a sheet. If the bulb (*b*), instead of being blown in the air,

is blown when the mass of soft glass is inside a suitable metal mould, a moulded bottle is obtained; after this has been cracked off at the neck by the wet iron, the neck is softened and shaped. A bulb like *b* may be the starting-point for almost any kind of hollow-blown vessel. Thus, if softened near the blow-pipe end and stretched by swinging, we may obtain *f*; and if the bottom of *f* is flattened on the iron slab, we get *g*. To detach *g* for making such an article as an open-mouthed vase, the end of a rod of iron (ponty, pontil, or working rod) is dipped in the glass pot and attached to the bottom of *g* by the small patch or seal of soft glass (see *h*). By the use of the wet iron the bottle-like vessel is cracked off at



Glass Blowing and Stretching.

the dotted line. The mouth of the vase is now softened at the furnace, and while the operator sits in an armchair having long straight arms, he rolls the working rod backwards and forwards across both arms of the chair in front of him, at the time bearing obliquely with a metal rod against the open end of the glass vessel. The working rod is now detached by cracking off the seal of glass by means of the wet iron; and when the vase has been annealed, the rough place at the bottom (ponty mark) is ground away. If the mass *c* is drawn or pulled out by attaching a ponty (as shown at *h*), we obtain a glass rod; while if the bulb *c* is simi-

larly pulled out, we obtain a glass tube.

Annealing.—When thick glass is allowed to cool rapidly in the air, the outer parts chill first, and the whole object is put into a condition of unequal strain, so that the article will often break spontaneously, and if scratched it will sometimes disintegrate almost explosively into a coarse powder. To avoid this, ordinary glass articles are allowed to cool very slowly in special ovens, called annealing ovens, the cooling often extending over several days.

Toughened Glass.—When articles of glass are thin, not very irregular in substance, and of such a shape that inside and outside can be cooled equally rapidly and simultaneously, quick cooling or a uniform lack of annealing gives a peculiar kind of strength against concussion, which is sometimes called toughening.

Grinding, Cutting, and Polishing Glass.—Well-annealed glass can be ground down with sand and water, or with emery and water. If the grinding material is used in successively finer grades, and polishing powders, such as putty powder or jewellers' rouge, are used afterwards, an artificial surface can be given to glass. Both surfaces of the cast plate glass mentioned above are usually ground flat and polished. Decorative articles of glass, ground down and polished in facets, are of daily use ('cut glass.') Optical lenses are ground against metal moulds of suitable curvature and then polished.

Glass Painting and Staining.—A glass-painter's pigment consists of a highly fusible glass with which has been incorporated a considerable proportion of a colouring metallic oxide or mixture of metallic oxides. If such a pigment is rubbed down on a slab with weak sugar water, or with oil of turpentine which has become thick by exposure to the air, glass can be painted upon quite easily. The glass is fired at a heat sufficient to burn off the medium and completely to melt the pigment, but only sufficient to soften the glass. To effect this an iron plate is covered with a uniform layer of powdered plaster of Paris or of powdered ganister, the painted glass is laid on this even surface as a protection against distortion, and the whole is placed in a suitable kiln which can be raised slowly to a red heat and then allowed to cool equally slowly.

Silica Glass.—Though not a true glass, fused silica itself has been introduced for scientific purposes. It is prepared by melting rock crystal in the oxyhydro-

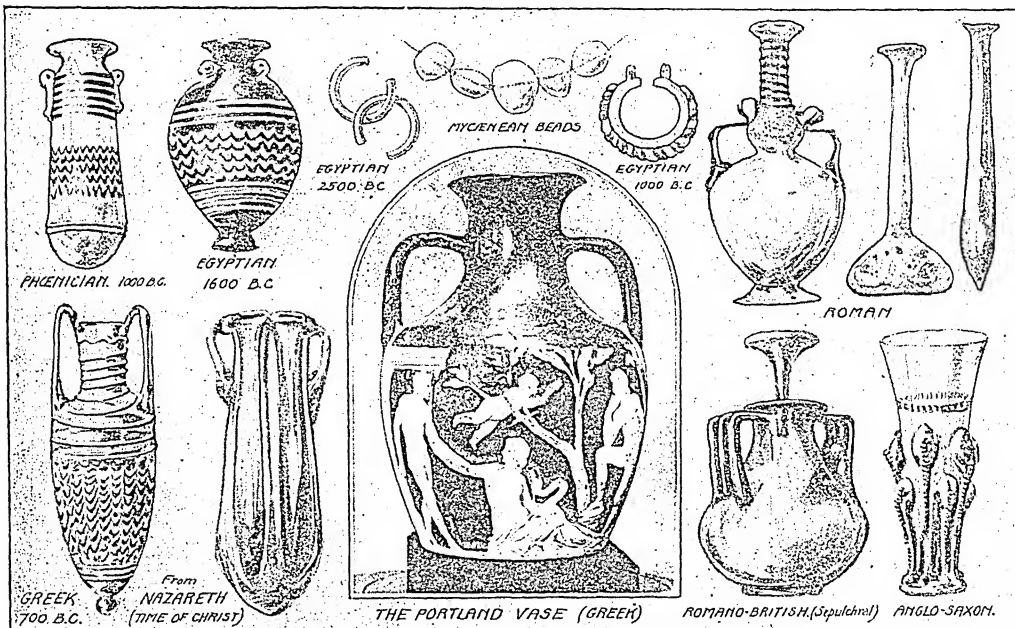
gen flame or electric furnace, and forms a transparent, colourless glass of the highest degree of infusibility, resistance to acids, and freedom from liability to crack or change.

For further information on ancient glass, see Wallace-Dunlop's *Glass in the Old World* (1883); on glass manufacture and working, Powell, Chance, and Harris's *Principles of Glass Making* (1883); on optical glass, Fischer's *Jenaer Glas und seine Verwendung*; on grinding and polishing, Orford's *Lens Work for Amateurs* (1895); on table-glass blowing, Shenstone's *Glass Blowing* (1889), Bolas's *Glass Blowing and Working* (1898), and Bate's

lowing:—(1.) In church government, each community is absolutely independent, under its own elders. (2.) In the conduct of the services, there is equality of ministry among the elders. (3.) In doctrine, the Glassites hold the necessity of justification by faith alone, while nevertheless works are requisite as a proof and effect of faith. All assurance of salvation is presumption. (4.) In practice, they 'abstain from things strangled and from blood,' and in other ways endeavour to carry out literally the Scriptural commands. The name Sandemanians, by which the sect is usually known in England and America, is derived from Robert

by a commensal zoophyte, whose presence gave rise to much discussion and controversy when the sponge was first known. See COMMENSALISM and SPONGES.

Glass-snake (*Ophisaurus palasi*), a lizard of the family Anguidæ found in S. Russia and extending into Morocco. Like the British blind-worm, it is devoid of limbs, these being represented only by spikes near the anus. Though the tail and body are snakelike, the head is like that of a typical lizard, and is furnished with strong teeth. The food consists of snails, worms, insects, and small vertebrates. The animal grows to a length of over three feet.



Examples of Ancient Glass Work.

English Table Glass (1905); and on glass painting, Gessert's *Painting on Glass* (1851), Whitehead's *Stained and Leaded Glass* (1909), and Whall's *Stained Glass* (1905).

Glass-crab, or *PHYLOSOMA*, a name given to a delicate pelagic crustacean before it was known that this is merely the young form of the rock-lobster (*Palinurus*).

Glasse, HANNAH (fl. 1750), English writer on cookery, published in 1747 the first edition of her *Art of Cookery*. She also wrote *The Compleat Confectioner* (c. 1769) and *The Servant's Directory* (1770). Her works were falsely ascribed to Dr. John Hill.

Glassites, GLASITES, or SANDEMANIANS, a religious sect founded by John Glas in Scotland in 1725. Its main principles are the fol-

Sandeman (1718-71), the son-in-law and supporter of John Glas. See GLAS, JOHN.

Glass Paper, calico or paper covered with thin glue and sprinkled with powdered glass, is made chiefly at Birmingham. It is used for levelling and smoothing wood, and for polishing wood and metal.

Glass-rope Sponge (*Hyalonema*), a siliceous sponge from the Japanese seas, is ovoid and cup-shaped, the top of the cup being closed by a sieve-plate. From the lower end of the cup extends the 'rope,' which is composed of twisted strands of silica, like spun threads of glass. The use of the rope is to anchor the sponge in the mud. It is invested for a considerable part of its length

Glasswort, MARSH SAMPHIRE, or *SALICORNIA*, a genus of leafless herbs which grow on the seashore. They belong to the order Chenopodiaceæ. The popular name, 'glasswort,' is derived from the fact that much of the soda formerly required for glass manufacture was derived from barilla, the ash of various members of this genus of plants. The jointed glasswort, or crabgrass (*S. herbacea*), is a common annual British plant, occurring in seaside marshy ground.

Glastonbury (also *Avalonia*, or 'the Isle of Avalon'), a munic. bor. in Somersetshire, England, 6 m. s. of Wells. Ina, king of the West Saxons, founded or enlarged a monastery there. Dunstan, abbot in the 10th cen-

tury, contributed much to its advancement. In 1184 it was almost entirely destroyed by fire. At the time of the dissolution the monastery was one of the richest in the country. Of that building there remains the Abbot's Kitchen. Other ancient buildings are the Abbot's Barn, the George Inn (formerly the Pilgrim's Hostelry), the Tribunal or Abbey Court, and two churches. Here grew the famous 'Glastonbury Thorn,' the *Crataegus precox*, which, according to popular belief, blossomed every Christmas day. Though destroyed during the Cromwellian period, grafts still exist. In 1892 the site of a British lake village was opened at Godney, N.W. of the town. Pop. (1901) 4,016.

Glatz, tn. and fortress in prov. of Silesia, Prussia, on the Neisse, near the Bohemian frontier, and 58 m. S.W. of Breslau. The manufactures include iron goods, machinery, furniture, spirits, etc. The chief defences are two citadels, one rising 200 ft. above the town. Pop. (1900) 14,926.

Glauber, JOHANN RUDOLF (1603-68), German chemist, a native of Karlstadt (Franconia), was a zealous alchemist; but his researches resulted in valuable chemical discoveries. He was the first to produce hydrochloric acid from oil of vitriol and salt; and sodium sulphate, also discovered by him, bears the name of Glauber's salt. His *Opera Omnia* appeared at Amsterdam in 1661 (Eng. trans. 1689).

Glauber's Salt (sodium sulphate, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) is prepared by treating salt with sulphuric acid, expelling the hydrochloric acid by heat and crystallizing from water. It occurs in transparent crystals, is bitter to the taste, and soluble in water. It is a mild but efficient laxative and diuretic, and is an important product of natural mineral waters, such as Carlsbad and Hunyadi Janos, and of the effervescing sodium sulphate.

Glauchau, tn., kingdom of Saxony, Germany, 20 m. by rail W. of Chemnitz, is one of the busiest manufacturing centres of the kingdom, its specialities being woollen dress stuffs, though it has also dye works, calico-printing works, iron foundries, breweries, flour and saw mills. Pop. (1900) 25,677.

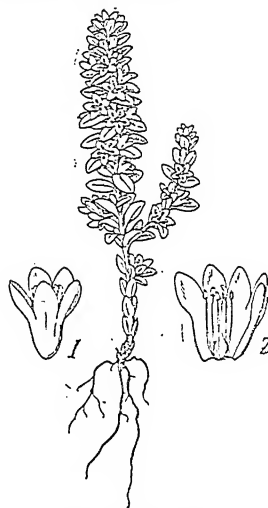
Glaucium, a genus of plants belonging to the order Papaverales, and characterized by a two-lobed stigma and a long, two-valved podlike capsule. The yellow-horned poppy, *G. flavum*, is a not uncommon British plant, generally found growing on the seashore. It has hairy, glaucous leaves and large, yellow, poppy-like flowers in summer.

Glaucoma is a disease in which there is increased pressure of fluid within the eyeball. In health, the continual exudation of fluid into the interior chambers of the eye is balanced by a corresponding outflow through certain veins. In glaucoma, either the secretion of the internal fluid is excessive, or the drainage is defective. Even in the early stages of glaucoma there is impairment of sight, together with unusual tension of the eyeball. The veins on the sclerotic or white of the eye become distended and tortuous, and the ophthalmoscope reveals pulsation of the vessels over the optic disc where the optic nerve shows upon the retina. As the disease advances, the optic disc becomes depressed ('cupped' is the term used). The field of vision decreases, and even objects in its centre are seen indistinctly, until finally the optic nerve becomes atrophied through pressure, and sight is entirely lost. The pupil is almost constantly dilated and immobile. In treatment, myotic or pupil-contracting drugs are employed, so as to thin out the iris and allow of more free outflow of the fluid which is causing the trouble. This alone, however, is rarely sufficient, and recourse must be had to operative measures. Of these the most efficacious is iridectomy, in which a portion of the iris is removed. Of less importance, though useful in some cases, is sclerotomy, in which the sclerotic is incised. A more recent operation is Ionesco's, in which the superior cervical ganglion of the sympathetic, which controls the circulation in the eye, is excised. The value of this operation is as yet doubtful. The theory is that glaucoma arises from irritation of this nerve; but the operation is a very serious one, and by no means always successful. Electricity applied near the same nerve is stated to have had good results in some cases. No operative procedure can do more than arrest the disease; the damage previously done to the eye is irreparable.

Glaucinite, the 'green muds' of eruptive rocks, a hydrous silicate of iron and potassium, granular, dark green in colour, forming little nodules. It is abundant in the green sand, and has been proved by the *Challenger* expedition to have a wide distribution over the sea bottom. It gathers in the empty shells of dead Foraminifera, and when these are dissolved away by the slow action of sea water, glaucinite casts are left which have the form of the interior cavity of the shell. Some beds of the Cretaceous system contain from sixty to seventy per cent. of glaucinite.

Glaucus, a genus of small nudibranch molluscs, the species of which are found floating at the surface in the Atlantic and Pacific Oceans. The body bears three pairs of lateral lobes, which are fringed with papillae, and is slender and elongated. The food is stated to consist of small pelagic jelly-fish.

Glaucus. (1.) In ancient Greek legend is said to have built the ship *Argo*, and to have gone with the Argonauts as their steersman. In Jason's sea-fight against the Tyrrhenians, Glaucus alone was unwounded; but he sank to the bottom, and became a god of the sea. (2.) The father of Bellerophon. According to ancient legend he was torn in pieces by his own mares (which he did not allow to breed), because he despised the power of Aphrodite. (3.) Grandson of Bellerophon, a Lycian prince, who was one of the allies of the Trojans against the Greeks. He is famous for his conversation with Diomedes, and for his exchange of armour with that hero. He was slain by Ajax.



Glaux maritima.

1, Flower; 2, calyx, laid open.

Glaux maritima, or SEA MILKWORT, is a hardy perennial seashore plant belonging to the order Primulaceae. It is a common little British plant, with glaucous leaves, and pink flowers in summer.

Gleaning, or LEASING, an ancient custom by which the poor are allowed to glean a field after its owner has gathered the harvest, without being guilty of trespass. It was enforced on the Jews by the Mosaic law (Lev. 19:9, 10), and an instance is given in the well-known story of Ruth (Ruth 2:2, 3). The Court of

Common Pleas has settled that in England no person can claim at common law a right to glean, nor has it ever been specifically recognized by any judicial determination. The custom does not exist in the United States.

Glebae Adscripti, Roman agricultural class, corresponding to the villein socmen of Saxon times.

Glebe. In England glebe is the land assigned to the incumbent of a parish for his support or residence, and is the oldest form of parochial endowment. Glebe land (except the vicarage) may be sold or exchanged with the consent of the Board of Agriculture, the bishop, and the patron. Mining leases for sixty, building leases for ninety-nine, and farming leases for fourteen years may be granted by the incumbent with the consent of the bishop and the patron. Glebe may sometimes be mortgaged to repair or build a parsonage. In Scotland the minister of every civil landward parish, and the minister who has the first charge in a burghal parish with a landward district, is entitled to four acres Scots arable, or sixteen souns pasture land as glebe, in addition to half an acre for a manse. A soun affords pasture for one cow. The Glebe Lands (Scotland) Act, 1866, provides facilities for feuing.

Glee (a musical form) is a composition for at least three voices, with one voice only for each part, and consists of two or more contrasted movements. It is unaccompanied, and generally for male voices only. The glee is of entirely English origin; its best period covers the latter part of the 18th and the earlier part of the 19th century. The most eminent composers of glees are Dr. Arne (b. 1710), Samuel Webbe (1740-1816), Stevens (1757-1837), and Callicott (1766-1821), founder of the Glee Club (1783). See W. A. Barrett's *The English Glee and Madrigal Writers* (1886).

Gleichen, COUNT, PRINCE VICTOR OF HOHENLOHE-LANGENBURG (1833-91), German sculptor, nephew of Queen Victoria; served in the Crimean war, both in the Baltic and before Sebastopol (1854-6), and in the Chinese war of 1857; and was made admiral in 1887. He also devoted himself to sculpture. A statue of Alfred the Great erected at Wantage (1877) is his best-known work.

Gleichenberg, picturesque wat.-pl. in the Austrian prov. of Styria, 37 m. S.E. of Graz by rail. Resident pop. about 800.

Gleichenia, a genus of tropical ferns, most of which have a creeping root-stock and deeply pinnatifid pinnae. The fronds usually branch dichotomously.

Gleig, GEORGE (1753-1840), Scottish author, was born at Boghall, Kincardineshire. He contributed largely to the *Monthly Review*, *Anti-Jacobin Review*, and *Gentleman's Magazine*, and after 1793 edited the *Encyclopædia Britannica* (vols. xiii.-xviii.), subsequently writing the two supplementary volumes (1801), almost without assistance. Elected bishop of Brechin (1808), he was primus of Scotland (1816-37). He wrote *Directions for the Study of Theology* (1837), a *Life and Writings of William Robertson* (1812), and other works. See *Life* by William Walker (1878).

Gleig, GEORGE ROBERT (1796-1838), British author, was born at Stirling. He served in the Peninsula under Wellington in 1813-14 (San Sebastian, the Bidassoa, the Nivelle), and later in America (1814). Retiring on half-pay after Waterloo, he graduated at Oxford, and after taking orders (1820), was presented to the perpetual curacy of Ash in Kent. Appointed chaplain of Chelsea Hospital (1834), he became chaplain-general of the forces (1834), and inspector-general of military schools (1846). He was the author of several novels, of which the chief is *The Subaltern* (1826), also of a *History of India* (1830-5), *Lives of Military Commanders* (1831); biographies of Warren Hastings (1841), Clive (1848), and Wellington (1862).

Gleim, JOHANN WILHELM LUDWIG (1719-1803), German writer, was born at Ermsleben, near Halberstadt, and at Halle founded a literary society with Uz and Götz. In 1740 he was a private tutor at Potsdam, lived for a time at Berlin, and then settled (1747) at Halberstadt, where he became distinguished by his generous support of authors who hoped to see, or had seen, better days. His first work was the *Versuch in Scherzhaften Liedern* (1744-5), which made him the leader of the Anacreontic school. These poems are of as little value as the fables and the comedy he wrote. His most important work was *Preussische Kriegslieder von einem Grenadier* (1756-7), which surprised by their graphic touches and local colour (largely derived from letters sent to Gleim by E. von Kleist), and their strong popular note, which had not been heard in German literature for some two centuries. Gleim's complete works were published by Körte (1811-13), who also wrote his *Life* (1811); the *Preussische Kriegslieder* have been edited by A. Sauer (1882).

Gleiwitz, tn., prov. Silesia, Prussia, lies 43 m. by rail S.E. of Oppeln; with iron, brick, and glass industries. Pop. (1900) 52,362; (1905) 61,297.

Glen, WILLIAM (1789-1826), Scottish poet, was the son of a merchant in Glasgow. After an unsuccessful experience of trade and of farming, he published (1815) certain poems, including the popular song, *Wae's me for Prince Charlie*.

Glenalmond, the valley of the Almond, Perthshire, Scotland, the finest part of which is known as the Sma' Glen. Near the river is Trinity College, founded in 1841 by the initiative mainly of Mr. W. E. Gladstone, with the purpose of raising a public school for Scottish Episcopalians on the model of the great English public schools. The first warden was Charles Wordsworth, afterwards bishop of St. Andrews.

Glencairn, EARL OF, a title, derived from a parish in Nithsdale, Dumfriesshire, Scotland, conferred in 1488 on Lord Cunningham of Kilmaurs. The most notable of the earls of Glencairn were William, fourth earl (d. 1547), who was one of the most strenuous supporters of the Scottish policy of Henry VIII., and was defeated by Arran (1544) at Glasgow Muir; Alexander, fifth earl (d. 1574), one of the few Scottish nobles who was a consistent supporter of the reformed party, and author of a satirical poem against the order of Grey Friars; William, ninth earl (?1610-64), who became a warm supporter of Charles II., in whose behalf he organized a rising in the Highlands in 1653, but was defeated at Dunkeld (1654)—his services were recognized at the restoration by his appointment to the office of lord chancellor of Scotland; and James, fourteenth earl (1749-91), the friend and benefactor of Burns. With the death of John, fifteenth earl, in 1796, the title became extinct.

Glencoe. (1.) Valley, Argyllshire, Scotland, running for 10 m. E. from Ballachulish to Loch Etive. It is famous as the scene of the massacre of the MacDonalds in February 1692. (See SCOTLAND—History.) (2.) Town, N. Natal, British S. Africa, 130 m. N. of Durban. A branch line runs to the Dundee coal fields from this place.

Glencorse, par., Midlothian, Scotland, on N. Esk, 14 m. S. of Edinburgh by rail. Edinburgh draws part of its water supply from Glencorse reservoir. Pop. (1901) 1,347.

Glendalough, a beautiful mountain-encircled vale in Wicklow, Ireland; celebrated for its seven churches and other ancient remains. Here, in the 6th century, St. Kevin founded a monastery, around which a 'city' grew up and flourished for several centuries.

Glendower, OWEN (?1359-?1416), claimed descent from the ruling princes of Wales, and through his mother from Llewelyn. Being wronged by Lord Grey of Ruthin, he rebelled, and assumed the title of prince of Wales. For fifteen years he maintained an unequal contest, allying himself with the Percies (1403), Ireland, Scotland, and France (Charles VI.). He captured Grey and Mortimer, but refused to accept pardon from Henry V., though his wife and daughter had been made prisoners. See Thomas's *Memoirs of Glendower* (1822).

patients suffering from pulmonary affections.

Glengarry, valley, Inverness-shire, Scotland, is traversed by the river Garry. The glen was the home of the Macdonnells, and the last chief of the family, Colonel Alexander Ranaldson Macdonnell is said to have been Scott's model for Fergus MacIvor in *Waverley*.

Glenlivet, valley, Banffshire, Scotland. Prior to 1824, the glen was famous for the illicit manufacture of whisky. Since that date the Glenlivet distillery has acquired a great reputation. In 1594 the Protestants, under the Duke of Argyll, were here de-

1,155 ft. The origin of the terraces has been the subject of much controversy, but the generally accepted theory is that they represent the shore lines of ancient fresh-water lakes, whose levels were reduced at long intervals by the recession or the melting of the glacial dams at the extremities of the valley.

Glen's Falls, vil. of Warren co., New York, U.S.A., beautifully situated on the Hudson R., 55 m. N. of Albany. The island below the falls figures in Fenimore Cooper's *Last of the Mohicans*. It is a popular summer-resort. Pop. (1900) 12,613.



Glendalough, Co. Wicklow, Ireland.

[Photo by W. Lawrence.]

Glenelg. (1.) South Australian wat.-pl., on Holdfast Bay, 6½ m. s.s.w. of Adelaide. Pop. (1901) 3,949. (2.) River of Victoria, Australia; rises in the Grampians, and winds s. to Discovery Bay, beyond Nelson, with a course of 281 m.

Glenfinnan, a glen, Inverness-shire, Scotland, 18 m. w. of Fort William, where in 1745 the clans gathered, under Prince Charles Edward.

Glengarriff, vil., Co. Cork, Ireland, 6 m. n.w. of Bantry, and on the upper portion of Bantry Bay. The beautiful well-wooded glen is much frequented by tourists, and the village is a favourite health-resort during winter for

feated by the Roman Catholics, under the Earl of Huntly.

Glenmore, valley, Inverness-shire, Scotland, begins s.w. of Inverness, and stretches over 60 m. in a s.w. direction to Loch Eil, near Fort William. It contains Lochs Ness, Oich, and Lochy, which are united to form the Caledonian Canal.

Glenroy, a narrow valley, Inverness-shire, Scotland, 13 m. n.e. of Fort William. It is remarkable for its three natural terraces, commonly known as 'the parallel roads of Glenroy,' at corresponding altitudes on opposite sides of the valley, the lowest being at 862 ft., and the highest at

Glen Shiel, par. on Loch Duich, Ross-shire, Scotland, 8 m. s.e. of Lochalsh. Here, in June 1719, an indecisive battle was fought between 1,500 Jacobites (assisted by 274 Spaniards) and 1,600 royalists. Pop. (1901) 343.

Glen Steamship Line, running between London, China, and Japan, was begun about thirty years ago by Messrs. McGregor, Gow, and Co., whose service for cargo and passengers is one of the most important of the few lines now owned privately. The fleet consists of seven steamers, aggregating 31,863 tons.

Glentilt, valley, N. Perthshire, Scotland, traversed by the Tilt,

which runs 13½ m. s.w. into the Garry at Blair Athole. The glen was the subject of a famous right-of-way case in 1845.

Gliddon, GEORGE ROBINS (1809-57), English Egyptologist, born in Devonshire; went when young to Cairo, where he lived twenty-three years; then proceeding to America, he became the pioneer of Egyptology in that country. Among other books he wrote *Discourses on Egyptian Archaeology* (1841), *Ancient Egypt* (1850; new ed. 1853), *Otia Egyptica* (1849), and *Types of Mankind* (1854).

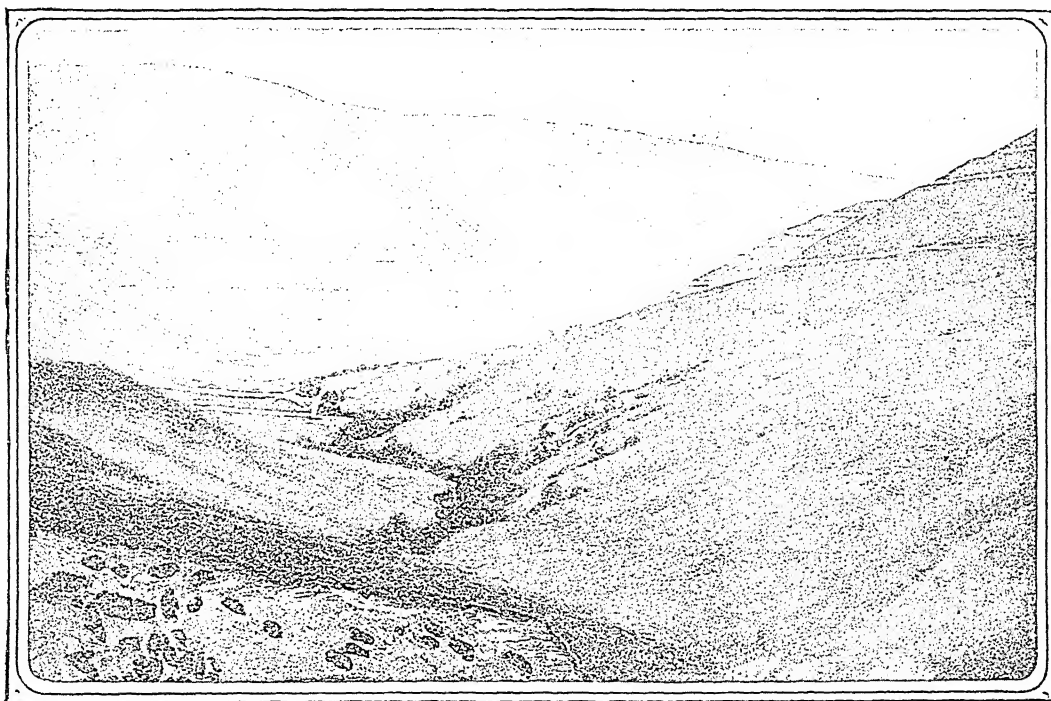
Globba, a genus of East Indian

policy. In later years the *Globe* has been the implacable enemy of 'Little Englandism.' In 1878 it caused a great sensation by publishing the text of the Salisbury-Schuvaloff treaty, and in 1901 its manager and editor were summoned to the bar of the House of Commons, and compelled to apologize for a statement reflecting on the character of the Irish Nationalist members.

Globe, tn., Arizona, U.S.A., the co. seat of Gila co., 90 m. N. of Tucson. It is the centre of a rich gold, silver, and copper district. Pop. (1900) 1,495.

Globe Amaranth, a name

distinguished by the short, thick body with well-developed fins, the thick, scaleless skin which is armed with spines, and the power of distending the gullet with air, so that the body assumes a more or less globular form. Like the related sun-fish, they have a sharp-cutting beak, formed by the confluence of the bones of the jaws. When the body is distended with air, the spines are erected, and the fish float at the surface back downwards, the spines forming a protection against possible enemies. Abundant in tropical and sub-tropical seas, the globe-fish are often brilliantly coloured, and



Glenroy, showing the 'Parallel Roads.'

[Photo by G. W. Wilson & Co.]

herbs belonging to the order Scitamineae. The flowers are yellowish to rose in colour, and tabular in form. They require stove heat in Britain.

Globe, THE, the oldest existing evening paper of London, was founded in 1803 in the booksellers' interest, as a rival to the *Courier*. In the middle of the 19th century it was especially favoured by Lord John Russell and Lord Palmerston, and became the ordinary medium for the official communications of the government. In 1866 the *Globe* was purchased by a Conservative syndicate, and its politics were changed from strong opposition to full support of Disraeli and his

given to plants belonging to the genus *Gomphrena*, a subdivision of the order Amarantaceae. They are scarcely hardy in Britain, but are admirable for conservatory culture.



Globe-fish.

Globe-fish are members of the family *Gymnodontes*, and are

usually haunt coral-reefs, where they feed upon corals, molluscs, and crustaceans. Many are—at least at times—highly poisonous, while others are said to be regularly eaten. Examples are the porcupine globe-fish (*Diodon hystrix*), which may reach a length of two feet, and the smaller *Diodon maculatus*, or spotted globe-fish.

Globe-flower, or **TROLLIUS**, a genus of plants belonging to the order Ranunculaceae. They are characterized by their flowers having about fifteen petaloid sepals in addition to five petals. The flowers are mostly yellow. *T. europaeus* is a native species, found in mountainous districts of Britain.

Globes. The first globes constructed were astronomical. Diodorus Siculus ascribes the invention to Atlas of Libya, whence the fable of his supporting the world on his shoulders. The oldest celestial globe extant is preserved at Naples. It is about six and a half feet in circumference, and the positions of the constellations with regard to the intersection of the equator and the ecliptic fix its date at about 300 B.C. Both Strabo and Ptolemy laid down rules for the construction of globes; but no Greek or Roman terrestrial globe has come down to us. In the middle ages celestial globes of metal were made by the Arabs, of which the oldest now existing was constructed at Valencia in Spain in 1080, and is in Florence. Famous as the oldest terrestrial globe, and as showing the knowledge of the world immediately before the voyages of Columbus, is that constructed by Martin Behaim of Nuremberg in 1492; while the Lenox globe in New York, engraved on copper, is the first post-Columbian globe (1510-12). This was followed by the globes of Johann Schöner, the third of which, dated 1523, shows the track of Magellan, the first circumnavigator of the earth.

The first English globes, celestial and terrestrial, were drawn by Emery Molyneux of Lambeth, London, and published in 1592. They were larger than any previously made, being twenty-six inches in diameter. Globes of large size were made by Tycho Brahé, W. J. Blaeu, M. V. Coronelli, and others. Colonel Langlois erected one in the Champs Elysées in Paris in 1823, 120 ft. in diameter. Wyld's globe, Leicester Square, London (1851-61), was more than 60 ft. in diameter; while one in the Paris Exhibition of 1889 was nearly 42 ft. in diameter. Elisée Reclus has put forth a magnificent project for a globe on the scale of 1:100,000 (nearly 418 ft. in diameter), which should show the polar depression and the continents and ocean beds modelled in their true proportions.

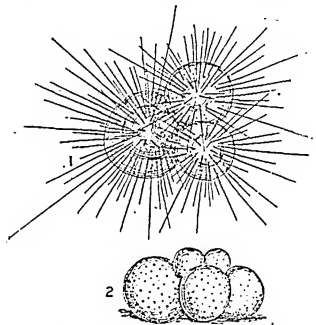
Ordinary globes are made by pasting sheets of paper over a spherical core until a sufficient thickness is attained. This shell is then cut into hemispheres, removed from the core, and glued together round a metallic axis. It is then covered with a mixture of whiting, boiled oil, and glue, and reduced to a perfect spherical surface by a semicircular arc of steel rotated round the poles. On the plaster the meridians and parallels are marked to guide the workman in pasting on the gores. A metallic meridian, at-

tached to the poles of the axis and graduated from the equator to the poles, surrounds the globe, and is supported by a pin on the stand, to which it may be clamped. It can slide through grooves in a horizontal circle, which is also divided into degrees, and shows the position of the sun in the signs of the zodiac on each day of the year. A properly furnished globe has also an index horarius or pointer, attached to the axis, which may be set to any meridian, and also a quadrant of altitude, which can be clamped to the meridian circle. This arc of metal is sometimes made 108 degrees long.

See *Erd- und Himmels-globen, ihre Geschichte und Konstruktion, nach dem Italienischen Matteo Fiorinis frei bearbeitet*, by Siegmund Günther (1895); *The History of Globes*, in *S. G. M.* (vol. xii. 1896); *Tractatus de Globis et eorum Usu*, by Robert Hues (ed. by Clements R. Markham for the Hakluyt Society, 1889); and W. and A. K. Johnston's *Handbook to the Terrestrial Globe* (1899).

Globe Theatre, London, was opened in 1868. The first production was *Cyril's Success*, one of H. J. Byron's liveliest pieces. In its early days the house changed hands very often, and its programme included every sort of dramatic entertainment, from tragedy to farce. In 1877 there was a comedieta by Mr. A. W. Pinero. During 1878 Mr. J. L. Toole contributed *Trying a Magistrate*; H. J. Byron's *A Fool and his Money* followed. Early in the 'eighties, Mr. John Hollingshead took a hand in the management. Between 1883-7, the best-known writers were Jerome K. Jerome, Robert Buchanan, Sydney Grundy, and A. W. Pinero. In 1893 *Charley's Aunt*, by Brandon Thomas, was transferred from the Royalty. In 1897 Mr. John Hare entered into possession. His first season was a full one; twelve plays were mounted, the best-known authors being David Christie Murray and Jerome K. Jerome. During 1898 *The Three Musketeers*, an adaptation by Henry Hamilton of Dumas's novel, suffered another resurrection. In April 1899 *The Gay Lord Quex*, by Mr. A. W. Pinero, was produced with great success. The Globe Theatre was closed on March 22, 1902. In Elizabethan times there was a famous theatre of this name, in which the plays of Shakespeare and contemporary dramatists were represented. It was built in 1599, and stood on Bankside, on the south side of the Thames. The pit was unroofed. The theatre was burned down in 1613, and again in 1644.

Globe Thistle. See ECHINOPS. **Globigerina**, a genus of Foraminifera, of vast abundance at the surface of the ocean. So abundant are these minute organisms that, as they die, their empty shells form a continuous rain falling from the surface to the bottom, where they accumulate to form the deposit known as globigerina ooze. The dead shells are minute structures,



Globigerina (G. bulloides).

1, Living; 2, shells.

composed of about seven chambers arranged in a spiral. In life the surface is prolonged into slender spines, and the shell is surrounded by a mass of bubbly protoplasm, which streams out along the spines. Globigerina ooze occurs over a vast stretch of ocean, both north and south of the equator.

Globiocephalus. See CA'ING WHALE.

Globularia, a genus of S. European plants belonging to the order Selaginaceae. The flowers are mostly borne in heads, and are usually blue or white in colour.

Globulins are a class of the proteids—i.e. of those complex compounds of carbon, hydrogen, oxygen, sulphur, and nitrogen found in living cells. They are characterized by insolubility in water, and solubility in dilute salt solutions; are precipitated by saturated salt solutions, and coagulated by heat. The principal globulins are serum globulin and fibrinogen obtained from blood, myosin from muscle, and crystallin from the crystalline lens of the eye.

Globus Hystericus is a sensation as of a ball rising from the chest into the throat and impeding respiration. It occurs in hysterical patients, and is commonly accompanied by sobbing and choking. It generally comes on before or during a paroxysmal attack, and is associated, as a rule, with hyperæsthesias and pains, which can often be traced to an ovarian source.

Glochidium, a name given to the larvæ found in the freshwater mussels of the family Unionidæ. In the swan mussel (*Anodonta cygnea*), for example, the eggs undergo development within the body of the mother, in a space between the lamellæ of the gills. The young so produced are quite unlike the mother, the valves of the shell having each a sharp incurved tooth. When discharged into the water, the glochidia attach themselves, if possible, to the tail, fins, or gills of a fish by means of the sharp teeth, and become for a time parasitic. Subsequently a metamorphosis occurs: the little bivalve acquires the adult form, and quitting the host, sinks down to the bottom.

Glockner, Gross, the culminating point of the Hohe Tauern range in the Central Tyrolean Alps, situated N. of Heiligenblut. It is a snowy summit, of a bell-shape, and rises to 12,461 ft. It was first climbed by some peasants in 1800.

Glogau, tn. and episc. see, prov. Silesia, Prussia, on the l. bk. of the Oder, 59 m. by rail N.W. of Breslau, ranks as a fortress of the second class. It has endured several sieges, especially in 1109, 1741, and 1814. The cathedral stands on an island in the Oder. Sugar, starch, machinery, and pottery are produced. Pop. (1900) 22,147.

Glommen, the largest river of Norway, rises N. of Røraas, s. of Trondhjem, and flows generally s., down the falls of Sarpsfos, and enters Christiania Fjord at Frederikstad. It is navigable a short distance above as well as below Sarpsfos. Total length, 330 m.

Gloriosa, a genus of tropical, bulbous plants, belonging to the order Liliaceæ. The plants are characterized by the leaves terminating in little tendrils. The best species is *G. superba*, about six feet in height, which bears beautiful red and orange axillary flowers.

Glory, a British first-class battleship (12,950 tons) launched at Birkenhead in 1899. The first ship to bear this name in the navy was the *Gloire*, captured by Anson from the French on May 3, 1747, off Cape Finisterre.

Gloss, originally an explanation of terms of unusual occurrence, inserted between the lines or in the margin of a book or manuscript. The term is also used as an equivalent of glossary, in an interlinear translation of, or series of verbal explanations upon, a continuous text. *Glossarium*, as used by the later classical writers, meant a collection of glosses; and in more modern times the word

glossary has been used for a dictionary of words in general. The most celebrated *glossarium* is the *Glossarium ad Scriptores Mediæ et Infimæ Latinitatis* of Du Cange (6 vols. 1733-6), with the *Supplement* of Carpentier (4 vols. 1766). The works of modern writers have been illustrated in this way by Tyrwhitt's *Glossary to Chaucer* (1775), and Nares's *Glossary to Shakespeare and his Contemporaries* (new ed. 1838).

In the Alexandrine period the work of the glossator was mainly confined to glossing the early Greek poets. Much later the glosses illustrating the language of Scripture were collected by Ernesti from the works of Hesychius, Suidas, Phavorinus, etc., under the title *Glossæ Sacre Hæcischii*, etc. (1785-6). There are two celebrated glosses on the Vulgate: (1) the *Glossa Ordinaria*, by Walafrid Strabo, a German, about the 9th century, the favourite commentary on the Bible; and (2) the *Glossa Interlinearis* of Anselm, dean of Laon. The term glossator is especially applied to one of the mediæval commentators on the texts of civil and canon law, when in the 12th century a school of civil law interpreters arose in Bologna. Of these, the most famous were Irnerius (12th century) and Accursius (13th century), with his *Corpus Juris Glossatum*, which, according to Hallam, 'made an epoch in the annals of jurisprudence.' Afterwards, the Decretals, the Sext, and the Clementines were ably glossed by different hands.

Glossodia, a genus of terrestrial orchids, natives of Australia. They bear blue flowers on an erect scape. A light, peaty soil is required for their cultivation.

Glossop, or GLOSSOP DALE, a munic. bor. and manufacturing tn., near the Peak, Derbyshire, England; has cotton, calico-printing, and paper mills. Pop. (1901) 21,526.

Gloucester. (1.) City and co. in itself, munic. and parl. bor., Gloucestershire, England, on the Severn, 114 m. W.N.W. of London. Public buildings include the cathedral, the 12th-century church of St. Mary de Crypt, bishop's palace, shire hall, guildhall, prison (the first built on Howard's plan), public library, technical schools, and public baths. It was originally a Roman camp during the Claudian invasion, and fragments of the walls still remain. Ship-building, coach factories, railway-carriage and wagon works, brass and iron foundries, flour and saw mills, roperies and potteries, are the leading industries. An abbey built by Osric in 681 was refounded in 821 for secular clergy, and in 1022 these gave place to Benedictines, introduced

by Canute. A new church was begun in 1089, and dedicated 1100; this building forms part of the present cathedral. The beautiful cloisters were completed in 1407, and the tower in 1457. In the cathedral are the tomb of Edward II., the monument of Osric, the effigy in Irish oak of Robert, Duke of Normandy, and a modern monument by Flaxman. Some of the stained-glass windows are of singular beauty. The episcopal see was founded by Henry VIII. in 1541, and in 1836 united with that of Bristol. A monument in the precincts of the cathedral marks the spot where Bishop Hooper was burned. In the civil war it was unsuccessfully besieged by the royalists. Triennial musical festivals are held at Gloucester. It returns one member to the House of Commons. Area (munic. city) 2,315 ac.; parl. city, 1,437 ac. Pop. (1901) munic. bor. 47,955; parl. bor. 45,146. (2.) City of Essex co., Massachusetts, U.S.A., on the N. coast of Massachusetts Bay, about 30 m. N.E. of Boston. The principal industry is cod and halibut fishing. In the vicinity is 'the reef of Norman's woe,' referred to in Longfellow's 'Wreck of the Hesperus.' Pop. (1900) 26,121. (3.) Post tn., Camden co., New Jersey, U.S.A., on the Delaware R., opposite Philadelphia; has cotton factories and terracotta works. Pop. (1900) 6,840.

Gloucester, EARLS AND DUKES OF. The earldom of Gloucester was conferred on Robert, a natural son of Henry I. The title then passed into the family of Clare, of whom Richard (1222-62), seventh earl, took a somewhat tortuous course in the civil wars of the reign of Henry III. Gilbert (1243-95), his son, was with Montfort at the battle of Lewes (1264), and fought against him at Evesham (1265); and Gilbert (1291-1314), ninth Earl of Gloucester, fell at Bannockburn. The title passed by marriage into the Despenser family.

THOMAS OF WOODSTOCK, FIRST DUKE OF GLOUCESTER (1355-97), seventh and youngest son of Edward III., distinguished himself by service at sea; having conspired against his nephew, Richard II., he was put to death at Calais by the king's order or connivance.

HUMPHREY, DUKE OF GLOUCESTER (1391-1447), youngest son of Henry IV., and known as the 'Good Duke Humphrey,' fought at Agincourt (1415), and on the death of his brother, Henry V., was regent of England during the infancy of Henry VI.

RICHARD (1452-85), son of Richard, third Duke of York, was created Duke of Gloucester at the coronation of his brother, Edward IV. (1461), and ultimately obtained the crown as Richard III.

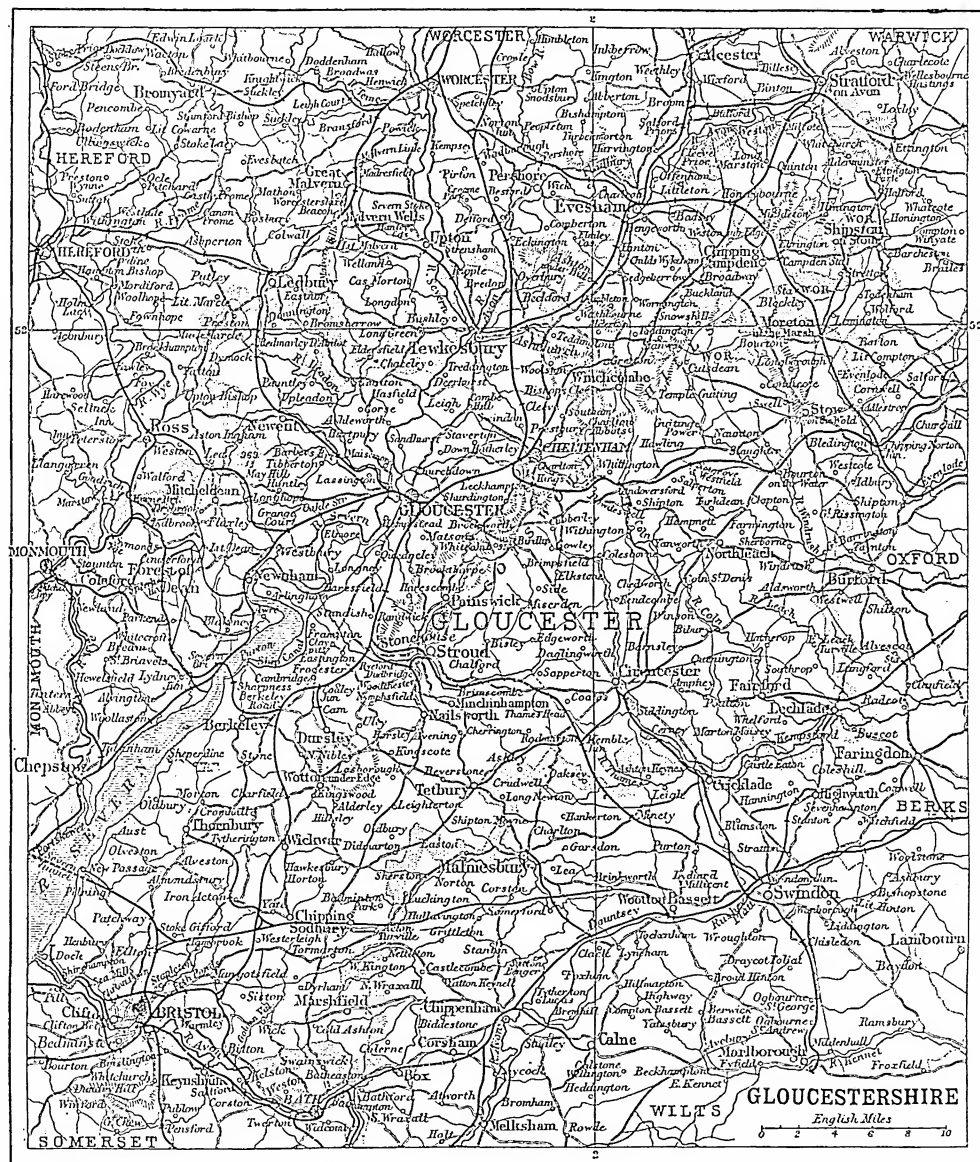
Gloucester, ROBERT OF. See ROBERT OF GLOUCESTER.

Gloucestershire, maritime co. in the W. of England, at the head of the Severn estuary. It comprises three natural divisions—

There are extensive orchards, and excellent butter and cheese are produced. The Forest of Dean and the Bristol coal fields give a total output annually of over 1,500,000 tons; other min-

earthenware, etc. The county returns five members to Parliament. Area, 1,243 sq. m. Pop. (1901) 634,729.

Glove, a covering for the hand. Gloves of silk, wool, and thread



the Hill or Cotswold, the Vale, and the Forest (including the Forest of Dean), W. of the Severn. The principal rivers are the Severn, Upper and Lower Avon, Wye, and Thames, which rises in the Cotswold Hills.

erals are iron (Forest of Dean), limestone, sandstone, ochre, and strontium sulphate. Of manufactures, the most important is that of woollens, including fine broadcloths (Stroud valley); others are silk, gloves, glass,

are all of secondary importance to the leathern glove. The former classes of gloves are knitted or woven. It is in France (Paris and Grenoble) that the majority of 'kid' gloves are made, the material used being

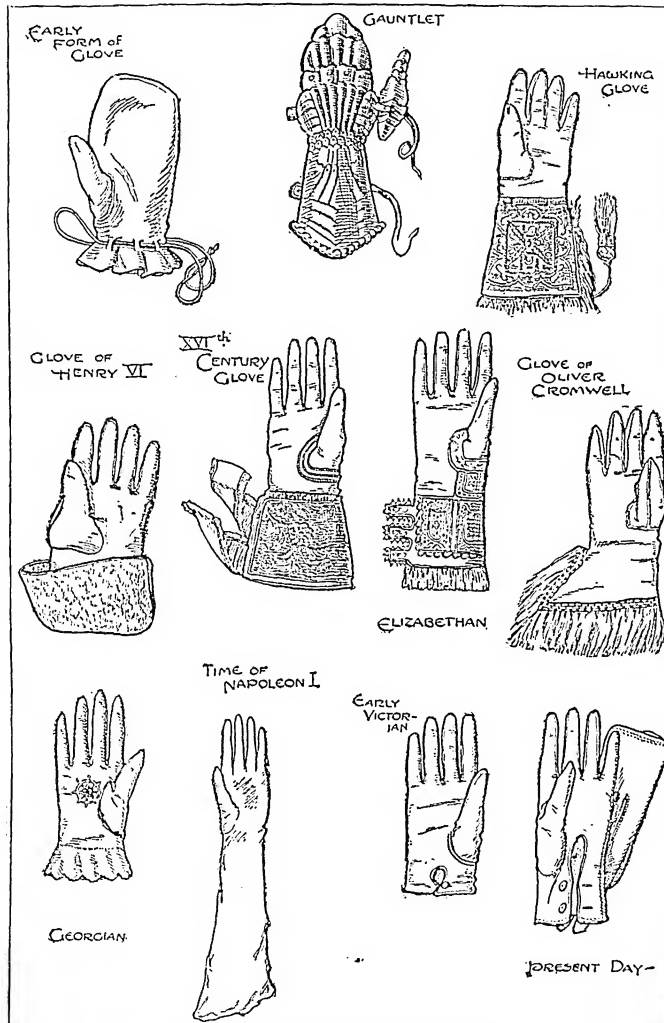
kid-skin, or more frequently sheep-skin. These gloves are of two kinds—glacé kid, made by dressing the outer side of the animal's skin; and suède, made by dressing the inner side. These are made in numerous pieces, and the process of cutting and sewing is one of great nicety. A speciality of English manufacture

were also habitually worn in the sport of hawking, when falcons were carried on the wrist. Gloves are said to appear amongst the finds of prehistoric cave-dwellings, and are known from the time of Cyrus; they are mentioned also in the *Odyssey*. In the East the transfer of a glove from seller to purchaser

wrote some verses in memory of Sir Isaac Newton, and in 1737 he published his once famous epic, *Leonidas*. His other works were the *Athenaid* (1787); *London, or the Progress of Commerce* (1739); two tragedies, *Boadicea* (1753) and *Medea* (1761); and a popular ballad, *Hosier's Ghost* (1739), intended to excite the English nation against Spain.

Gloversville, city, Fulton co., New York, U.S.A., 54 m. N.W. of Albany. The city derives its name from its glove factories. Pop. (1900) 18,349.

Glow Lamps. See **ELECTRIC LAMPS**.

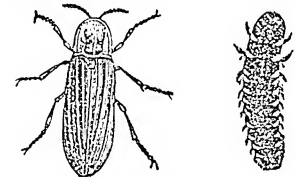


English Gloves of various Periods.

is the so-called 'dog-skin' glove, made from the skin of the Cape sheep. Berlin, Brussels, and Copenhagen are centres of the manufacture of the cheaper kinds of gloves. Gloves played an important symbolic part in feudal days, the throwing down of a glove being the recognized form of challenge to a duel. They

sealed the purchase of property. In the United States the glove-making industry is chiefly centred in Fulton co., New York, where it was established about 1760. See *Gloves, their Annals and Associations*, by Beck (1883).

Glover, RICHARD (1712-85), English poet, was born in London. At the age of sixteen he



Glow-worm and larva.

Glow-worm, the wingless female of the beetle *Lampyrus noctiluca*, which owes the first part of its common name to its luminosity, and the second to its grub-like appearance. The winged male, the eggs, larvæ, and pupæ, are likewise luminous, but the light emitted is much less intense than that of the female. To the same family (*Lampyridae*) belong a number of the other luminous beetles, the name fire-fly being usually given when wings and the power of flight are present. The fire-flies of Southern Europe are species of *Luciola*. In them both sexes possess wings, and the male differs from *Lampyrus* in being more instead of less luminous than his mate. In the common glow-worm the luminous organs are easily distinguished in daylight by their pale colour; they are placed near the end of the abdomen.

Gloxinia, a genus of tropical American plants belonging to the order Gesneraceæ. They have beautiful funnel-shaped flowers. Seeds should be sown in February; and if the young plants are carefully potted, they flower the first year. They require the temperature of a warm greenhouse during the summer months; but as the leaves die away in autumn, the roots may be stored in a dry place, merely protected from cold. They like a sandy soil, containing abundance of leaf-mould and peat.

Gluchov. See **GLUKHOV**.

Glucinum. See **BERYLLIUM**.

Gluck, CHRISTOPH WILLIBALD, RITTER VON (1714-87), German musician, born at Weidenwang in the Upper Palatinate. At Milan he was commissioned

to write an opera, *Artaxerxes* (1741), which had some vogue. In 1745 he was invited to London as 'composer of opera' to the Haymarket. The result is seen in the deserved failures *Caduta de' Giganti* and *Pyramus and Thisbe*, a curious *pot-pourri* of the best pieces from his other operas, etc. So far his work, with the poet Metastasio as librettist, had maintained the traditions of the Italian masters. A visit to Germany wrought a change in Gluck's conception of the relation between the words and action and the music. In 1762, when he had been for eight years director of opera in Vienna (where he settled in 1748), he met the poet Calzabigi, in whom he recognized the power to write an adequate libretto. Their collaboration is embodied in *Orpheus* (1762), *Alceste* (1767), *Paris and Helen* (1769); and the opinion of Gluck set forth at length in the dedicatory epistle to the last two justifies the opinion that he was the precursor of Wagner. Under the patronage of Marie Antoinette, a former pupil, he became successful in France. In 1774, *Iphigenia in Aulis*—with the libretto adapted by Du Roullet from Racine's tragedy—created a sensation that caused violent controversy. The departure from traditional standards shocked those who pinned their faith to Lully (died 1687) and Rameau (died 1764); while the adaptation of Racine's words to music by a foreign master offended many others. Gluck's famous rival, Piccini, was pitted against him. The warfare gave rise to a host of pamphlets and newspaper articles. The success eventually gained by *Iphigenia in Tauris*—Gluck's last great work (1779)—effectually routed the Piccinists. *Armida* (1777), we are told, was written to prove Gluck's great command of melody. Other works are *Baucis and Philemon* (1769), *Echo and Narcissus* (1779). It has been said of Gluck that to his Italian training he owed melody; that France taught him the value of declamation in recitative; that Germany gave him harmony, orchestration, and the philosophical mind which made him a musical reformer. See E. Newman's *Gluck and the Opera* (1895), and Reissmann's *C. W. von Gluck* (1882).

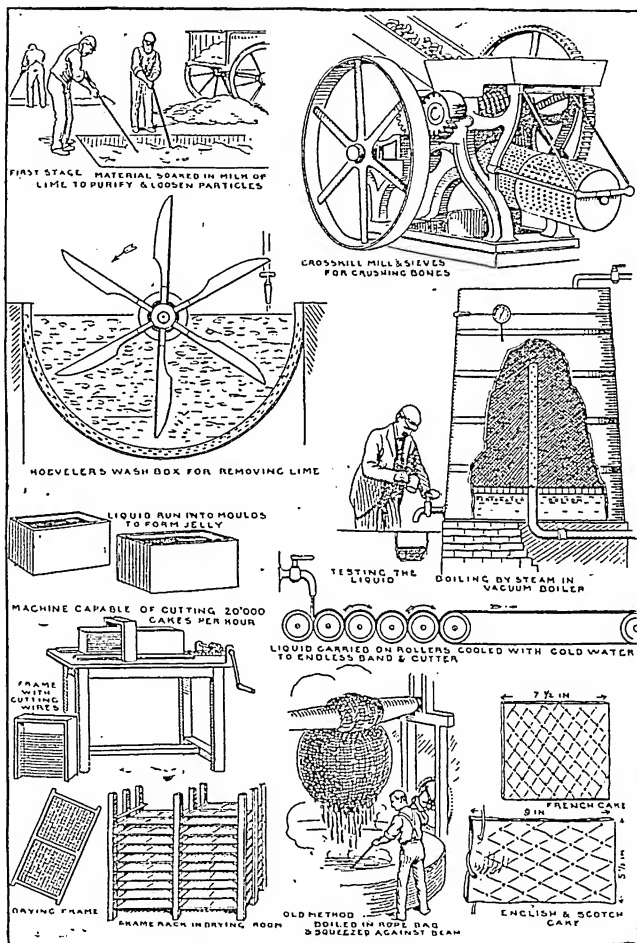
Glückstadt, tn. in Prussian prov. Schleswig-Holstein, on the Elbe, 33 m. by rail N.W. of Hamburg. It has railway shops, shipyards, and various manufactures. Fishing is important. Pop. (1900) 6,586.

Glucose. See DEXTROSE.

Glucosides are compounds of a sugar with other substances, from which the sugar is set free

by the action of ferments or dilute acids. Thus, the amygdalin of almonds yields glucose, prussic acid, and benzaldehyde, either when boiled with dilute acids, or acted on by the emulsin that is also present in almonds. Glucosides mostly occur naturally in plants, though some have been obtained synthetically; as a rule, they are crystalline solids. The

lute hydrochloric or sulphurous acid. The glue-stock is boiled with a definite quantity of water; the quality of the glue depends upon the length of time it is boiled. The boiler is smaller at the bottom than at the top, and, to prevent the stock burning or becoming charred, is provided with a false bottom. The glue-stock is boiled until it forms



Glue Manufacture.

following are among the most important: salicin, ruberythin, amygdalin, indicin, saponin, and myronic acid.

Glue. The best brown glues are obtained from hides; but sheep and other skins yield good quality light coloured glues, while bones give a weak glue. Glue-stock of the hide type is made with lime water or weak soda solution, whilst bones are decalcified by treatment with di-

a jelly. After that, the glue is drawn off into the clarifying vat. A fresh quantity of water is added to the stock, and a second boiling made, which produces a second (inferior) grade of glue. The residue of this second boiling is again boiled. Additions for the purpose of clarifying or colouring the glue are made during boiling; and as soon as the liquid has become clear and the fat has been skimmed

off in the clarifying vat, the glue is drawn off into moulds. After about twelve hours, when it has cooled or jellied, it is removed and cut into slices, which are again cut into squares, and laid on netting stretched over frames. These are placed in a rack fully exposed to dry air, so that the squares of glue shall dry from both sides; this is the most critical operation, as dampness or unequal drying causes the glue to decompose or become spoiled. When the cakes are dry enough to handle, they are removed, and their drying finished in a current of air in a warm room; a bright appearance is given by dipping the cakes in water and re-drying them. Fish glue is prepared by boiling down the skins of fish; and if well boiled, it is liquid when cold, and forms a very tenacious adhesive. See H. C. Standage on 'Special Glues,' in *Leather Trades Review* (May and July 1901); and S. Rideal's *Glue and Glue Testing* (1900).

Glukhov, or **GLUCHOV**, tn., Chernigov gov., S.W. Russia, 133 m. E. of Chernigov city. Near the town are the principal kaolin mines in Russia. Pop. (1897) 14,850.

Glumes, the scaly bracts or envelopes which surround the flowers of sedges and grasses.

Gluten, a grayish-brown adhesive, plastic, nitrogenous substance, obtained from wheat flour by kneading it in a stream of water until the starch is washed away. The residue of crude gluten is a mixture of two proteids—the first, a fibrin that is soluble; while the second, gliadin, is a vegetable gelatin that is insoluble in dilute alcohol. The best wheat flour yields from ten to eleven per cent. of gluten, which ultimate analysis shows to contain from fifteen to eighteen per cent. of nitrogen; inferior qualities of flour give from eight to nine per cent. of gluten, and oats, rye, and barley scarcely any. The food-value of gluten is high; and a mechanical action exerted by it during the manufacture of bread, in hindering the escape of carbon dioxide from the dough, renders wheat bread lighter than that prepared from rye and other flours.

Glutton, or **WOLVERENE** (*Gulo luscus*), a member of the weasel family, remarkable for its large size (length thirty inches or more). The name wolverene is applied to the animal in America. Fossil remains of the glutton occur in Britain and parts of Southern Europe, but it is now restricted to the northern parts of the European continent, and the northern forest regions of Asia and America. It is a clumsy, heavily-built animal, with short

thick limbs, powerful claws, and thick bushy tail, the dusky fur being somewhat coarse but long and thick. In habit it is nocturnal, and in spite of the clumsy appearance runs swiftly, and can also climb and swim. It possesses great strength, and will eat almost any kind of animal food, being specially notorious in N. America as a skilful robber of the hunter's traps.



Glutton or Wolverine.

Glycas, **MICHAEL**, Byzantine historian, probably a Sicilian. His *Biblos Chronike*, in four parts, consists of a history of the world from the creation to the death of Alexius I., Comnenus (1118).

Glycerin, or **GLYCEROL**, $\text{CH}_2\text{OH}\cdot\text{CHOH}\cdot\text{CH}_2\text{OH}$, is a trihydric alcohol, which is present as an ester of oleic, palmitic, and stearic acids in fats and oils. It was discovered by Scheele in 1779, and can be prepared synthetically from allyl tribromide, but is exclusively obtained by the hydrolysis ('saponification') of the fats and oils. This is carried out on the large scale in the manufacture of soap, but the glycerin thus obtained is mixed with impurities. The purification is carried out by neutralization, precipitation, concentration, etc., followed by evaporation and distillation with superheated steam. The distilled glycerin is then decolorized with animal charcoal, and concentrated under reduced pressure. Glycerin is much more simply obtained in the preparation of fatty acids for candle-making, by heating fats under pressure with water that contains a small quantity of lime, the liquor produced, or 'sweet water,' merely requiring evaporation to yield a product available for many purposes. The crude product is purified either by decolorization and distillation with steam, or by freezing.

Glycerin is a colourless, sweet, syrupy liquid, sp. gr. 1.265 at 15°C. It freezes if crystals of glycerin are added when cooled, and melts at 17°C. When heated under atmospheric pressure it boils (290°C.) with partial decomposition, but it can be distilled with steam, or under reduced pressure. It is very hygroscopic, mixes with water in all proportions, and acts as a solvent for many substances.

Chemically, it behaves like the alcohols, forming esters with acids, the chief of which is glycerin trinitrate, commonly called nitro-glycerin. Glycerin is used in medicine—externally, as an application for chapped and excoriated skin; and internally, as a flavouring agent, demulcent, and by injection as a means of relieving constipation. The main applications of glycerin, however, are in its esters. Nitro-glycerin is the basis of dynamite and other explosives, while compounds with arsenious and antimonious oxides are used as mordants, and with boric acid as preservatives.

Glycerol. See **GLYCERIN**.

Glycocoli, or **GLYCINE**, is aminoacetic acid, $\text{CH}_2\text{NH}_2\text{COOH}$, a sweet, crystalline body (m.p. 232°C.; sp. gr. 1.16), very soluble in water, that is prepared by the action of ammonia on chloroacetic acid. It occurs in some animal fluids.

Glycogen, animal starch, $(\text{C}_6\text{H}_{10}\text{O}_5)_n$, occurs chiefly in the liver, and is a white amorphous, tasteless powder, which dissolves in water, forming an opalescent solution. It gives a red colour with iodine; is converted to dextrose by boiling dilute acids, and to maltose by ferments.

Glycol, or **ETHYLENE ALCOHOL**, $\text{CH}_2\text{OH}\cdot\text{CH}_2\text{OH}$, is the first and best known of the series of diatomic alcohols. It is prepared by boiling ethylene bromide with potassium carbonate solution, and is a viscid, sweet, colourless liquid, sp. gr. 1.13, and b.p. 197.5°C.

Glycosmis, a genus of tropical trees and shrubs belonging to the order Rutaceæ. The flowers are small, but they and also the leaves are fragrant. They all like plenty of heat and a rich soil.

Glycosuria, a pathological condition characterized by the presence of sugar in the urine. It occurs in diabetes mellitus, and occasionally in the urine of gouty people, more especially if they are elderly and corpulent, and such cases may develop diabetes. Should glycosuria be present to any great extent, it is accompanied by rapid wasting of the body, and indicates a condition of extreme gravity. The treatment necessarily depends upon the cause, but usually it necessitates a diet free, or almost free, from sugar and starchy food.

Glycyrrhiza, a genus of hardy leguminous plants with pinnate leaves and flowers in racemes. The only species of importance is *G. glabra*, a blue-flowering kind, the source of liquorice.

Glyphæa, a genus of yellow-flowering, tropical African shrubs belonging to the order Tiliaceæ.

Glyptodon, an extinct fossil mammal, the remains of which have been found on the pampas of S. America, and less frequently in the United States. It belonged to the Edentata, and resembled a gigantic armadillo, but was about seven feet in length and four in height. Representatives of the group are found in the Miocene, but they attained their chief development in the Pleistocene.

Gmelin, a German family of chemists and naturalists. (1.) JOHANN GEORG (1709-1755), scientific traveller, was born at Tübingen. Appointed professor of chemistry and natural history at St. Petersburg (1731), he undertook a journey to Siberia (1733), the fruit of which appeared in his *Reise durch Sibirien* (1751-52) and *Flora Sibirica* (1748-9). He became professor of botany and chemistry at Tübingen in 1749. (2.) SAMUEL GOTTLIEB (1744-74), nephew of the foregoing, also born at Tübingen, was professor of botany at St. Petersburg (1767), made a scientific journey through Southern Russia, and was the author of *Historia Fucorum* (1768) and *Reise durch Russland* (1774-84). (3.) JOHANN FRIEDRICH (1748-1804), also a nephew of Johann Georg, became professor of natural history and botany at Tübingen in 1772, and of medicine at Göttingen in 1775. He published *Onomatologia Botanica Completa* (1771-7), a botanical dictionary. (4.) LEOPOLD (1788-1853), chemist, born at Göttingen, son of Johann Friedrich; occupied the chair of medicine and chemistry at Heidelberg (1817-51), where he died. His *Handbuch der theoretischen Chemie* (1817-19; Eng. trans. 1848-72) still holds its own as a manual. He also published *Versuch eines neuen chemischen Mineralsystems* (1825); also, in collaboration with Tiedemann, *Die Verdauung* (1826-7). (5.) CHRISTIAN GOTTLIEB (1792-1860), chemist, a nephew of Samuel Gottlieb, was a professor at Tübingen, and author of *Einleitung in die Chemie* (1833-7). See *Stammbaum der Familie Gmelin* (1877).

Gmünd, tn., Württemberg, Germany, 32 m. E. of Stuttgart. Manufactures jewellery, silver ornaments, and ornamental cases (cigars). Pop. (1900) 18,699.

Gmunden, summer resort of Austria, at the N. end of the Traun Lake and at the foot of the Traunstein (5,540 ft.). It is visited for its beautiful surroundings and its baths of divers kinds. It is the centre of the state salt monopoly. Pop. (1900) 7,126.

Gnaphalium, a genus of composite plants with heads of yellow or white flowers, all the florets being tubular and five-cleft, the involucre imbricated, the pappus

hairy, and the leaves covered with down. The marsh cudweed (*G. uliginosum*) is a not very common British plant. See EDELWEISS.

Gnat is a name given to the members of the insect family Culicidae, and also not infrequently to the members of the related family Chironomidae. The members of the first are more correctly termed mosquitoes, and of the latter midges.

Gneditsch, NIKOLAI IVANOVITCH (1784-1833), Russian poet, born at Poltava; passed from the education department at St. Petersburg to the imperial public library. He is remembered chiefly for his translation of the *Iliad* (new ed. 1884) into hexameters, after twenty years of labour, in 1829. Other translations are those of *King Lear* (1808) and the *Tancredi* of Voltaire (1816). A collection of his original poems, among which *Rybaki* (The Fishermen) stands pre-eminent, appeared in 1832.

Gneisenau, AUGUST WILHELM ANTON, GRAF NEITHARDT VON (1760-1831), Prussian field-marshal, born at Schildau (Prussian Saxony), joined the German mercenary force which in 1782-3 supported the British cause in the American war of independence. After taking part in the occupation of Poland (1793-5), he led a battalion at Saalfeld and Jena (1806), and his defence of Kolberg (1807) increased his military fame. Both as a member of the commission for the reorganization of the Prussian army, and as a commander at the battle of Leipzig (1813), he rendered valuable service, which he crowned by his successful direction of the Prussian force, as chief of staff under Blücher, in the campaign of Waterloo. Gneisenau was made governor of Berlin in 1818 and field-marshal in 1825. He died at Posen in 1831 while commanding the forces engaged in suppressing the Polish rebellion. See *Lives*, in German, by Pertz (1864-80), Delbrück (1882), and Neff (1880).

Gneiss, crystalline metamorphic rocks which consist typically of quartz, felspar, biotite, etc. In place of biotite some gneisses contain hornblende; others contain augite; or two or more of these three minerals may be present. Tourmaline, garnet, sillimanite, and kyanite may also occur, and give rise to distinct varieties. The 'gneissose structure' of the rock depends on the distribution of the component minerals, which are arranged in parallel or wavy bands or folia. Gneiss is very typical of the most ancient rock masses which are exposed on the earth's surface, and covers wide regions in Northern Europe, N. America, Switzerland, Brazil, India, Australia,

and China. Some hold that among the gneisses are to be found the representatives of the first crust which formed on the cooling surface of our planet. It is known that many are granites, which have been rolled out and sheared in the processes of mountain building. Others are sediments, which have been similarly affected. Many are perhaps great igneous masses, which have cooled at some depth below the surface, under conditions of pressure and movement which gave rise to their banded structure.

Gneist, HEINRICH RUDOLF HERMANN FRIEDRICH VON (1816-95), German jurist and politician, born at Berlin; became assessor of the *Kammergericht* or supreme court (1841). Appointed to an assistant judgeship at the *Obertribunal*, he resigned it (1850), and devoted the leisure, secured by his Berlin professorship (1844) of jurisprudence, to study. His works include *Die Bildung der Geschworenengerichte in Deutschland* (1849); *Das heutige englische Verfassungs- und Verwaltungsrecht* (1857-63), his most important work; *Budget und Gesetz nach dem konstitutionellen Staatsrecht Englands* (1867); *Die Stadtverwaltung der City von London* (1867); *Verwaltung, Justiz, Rechtsweg, Staatsverwaltung, und Selbstverwaltung nach englischen und deutschen Verhältnissen* (1869); *Hist. of the English Constitution* (1882; new Eng. ed. 1891); *Hist. of the English Parliament* (1886; 3rd Eng. ed. 1889). He issued the codes of Gaius and Justinian (1838). See O'Gierke's *Rudolf von Gneist* (1896).

Gnesen (Polish *Gniezno*), tn., prov. Posen, Prussia, lies 31 m. by rail E.N.E. of Posen. The cathedral dated originally from the end of the 9th century, but was rebuilt in 1760-90. Gnesen has been an archiepiscopal see since the year 1000, and down to 1320 was the place where the kings of Poland were crowned. Pop. (1900) 21,693.

Gnidia, a genus of small tropical African shrubs, with evergreen foliage, belonging to the order Thymelaceae. They are not infrequently grown as greenhouse plants, but a moist atmosphere is almost essential.

Gnome, a name applied by the Cabbalists and Rosicrucians to an order of subterranean beings supposed to guard treasures and mines. Paracelsus (16th century) makes *gnomi* = *pygmæi*; and the gnomes of popular belief are always dwarfs. They are uncouth and ugly. The Teutonic *kobold*, and the unseen Knockers whom English miners fancy they hear at work in their mine, are counterparts of the gnome. Among the Transylvanian gypsies the gnome

(*phuvush*, or 'earth-man') is an evil spirit, with power to seize upon unbaptized children. This 'earth-man' also figures in their traditional lore as the type of the aborigines of Transylvania, whom they speak of as a hairy, swarthy people, living in underground dwellings, and the actual progenitors of at least one tribe of existing Transylvanian gypsies. Indeed, from the point of view of the Euhemerists, this last aspect of the gnome, as the representative of a real race of people, is the best explanation of his existence in fancy. According to Engelhardt (*A Russian Province of the North*, 1899, p. 83), the dwarfish, thick-set Lapps bear a striking resemblance to the familiar representation of gnomes. See GOBLIN.

Gnome, a Greek word for judgment or thought, and in the plural, sayings or maxims—hence an aphorism or concise statement of a general truth. The Gnomic poets of Greece were simply those who embodied *gnomai*, or sententious maxims, on life and morals in their verse. Such were Solon, Theognis, and others. Their rise marks the dawn of moral philosophy in Greece.

GNOSSUS. See CNOSSUS.

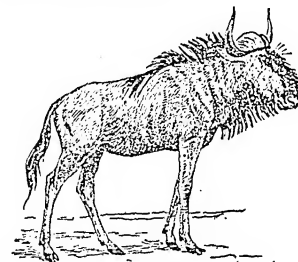
Gnosticism, a widespread and much diversified heretical movement which disturbed the Christian church during the first three centuries. To many of the eagerly speculative minds of the time, already imbued with syncretistic tendencies, there appeared a good prospect of winning a valid and satisfying philosophy of life from the interfusion of the older systems and the new religion, particularly if popular Christianity could be transmuted into a cosmology—i.e. if it could be raised from the position of a simple naïve faith to that of a *gnosis*, or system of esoteric knowledge, some hint of which possible transformation seemed to be given in the Scriptures (cf. 1 Cor. 12:8). The project was tried, and the resultant amalgamation of Greek philosophy, Oriental theosophy, and speculative Christianity was designated Gnosticism. All the ancient writers on the subject agree in fixing upon Simon Magus as its progenitor—the magician who, according to Acts 8:9-24, was venerated by his disciples as 'that power of God which is called Great,' and was denounced by Peter as an enemy of the faith; possibly also the opponents of Paul at Colossæ (Col. 2:8 ff.), Cerinthus, against whom John is believed to have directed the prologue of his gospel (John 1:1 ff.), and the Hymeneus and Philetus of the pastoral epistles, were all more or less affected with the incipient heresy. Menander and

Saturninus (or Satornilus), followers of Simon, promulgated a very characteristic tenet of the Gnostics in teaching that the world was not created by the Highest God, but by subordinate powers. The Carpocratians, the Ophites (Cainites, Naassenes, Peratae, in whose systems the serpent plays a great rôle) carry on the development—if that can be said to have a development which is really philosophy in delirium—and the culmination is reached in Basilides and Valentinus. The creative period of Gnosticism expires with the 2nd century, but its influences persist for another hundred years.

It must suffice here to enumerate certain general principles more or less recurrent in all the forms. Such are, for example, the view of Christianity as a speculative cosmology rather than as a dynamic of an ethico-spiritual life, and of salvation as to be obtained by acceptance of its supposed esoteric elements rather than by practical faith in its founder; the separation of the creator of the world, the Demiurge, and of the God of the Old Testament, from the Supreme Deity, between whom and the existent world there is a great gulf (Dualism), filled with an immense and elaborate hierarchy of æons and supernatural existences, one of whom is Christ the Saviour; the distinction between the heavenly Christ and the historical person Jesus in which he manifested himself (Docetism); the division of men into three grades—the pneumatic or spiritual, the psychic (animal, 'soulish'), and the hylic or material; finally, the tendency to asceticism on the one hand and unbridled libertinism on the other, springing both from the belief that the sensuous world is nought. The influence of all this upon the church was very great, though mainly indirect. The early fathers were not blind to its intellectual incoherence; they saw at once that, whatever it might be, it was not Christianity. The Gnostics, indeed, appealed to the apostolic tradition, and claimed to find support not only in the usually recognized writings, which they altered without scruple, and interpreted to suit themselves, but also in the apocryphal books of gospels and acts associated with the names of Peter, Thomas, John, Paul, etc., and specially in a secret tradition which they alleged to have been delivered by Jesus himself, and to have been transmitted esoterically by men of apostolic standing. This forced the orthodox party, which itself still occupied a very vague position as to the limits of the true apostolic tradition, towards the

important step of drawing up a canon of Scripture, to serve as an authoritative standard for the church's faith and practice. But it was in connection with the actual contents of the Gnostic philosophy that the church felt compelled to take measures—i.e. to make a beginning with a system of dogmatic theology—and over against the gnosis of the heretics she set up a gnosis of her own.

The only complete Gnostic production extant is the *Pistis Sophia* (trans. from a Coptic ms. into Latin by Schwartz, and edited by Petermann, 1853); fragments in Hilgenfeld's *Ketzergeschichte* (1884). Justin, Irenæus, Hippolytus, Tertullian, Epiphanius, are our main sources; treatises by Neander (1818), Baur (1835), Lipsius (1860), Matter (2nd ed. 1843), Mansel (ed. Lightfoot, 1875). See also Harnack's *Hist. of Dogma* (1894-9).



Brindled Gnu.

Gnu, or **WILDEBEEST**, the name given to two species of antelope belonging to the genus *Connochetes*, animals of bizarre form, presenting some superficial resemblance to buffaloes. Horns are present in both sexes, the withers are higher than the haunches, the head is broad and short, the mane erect, the tail long, and furnished with hairs throughout its length. The horns are cylindrical, and curve outwards, and then bend upwards near their tips. The white-tailed gnu (*C. gnu*) is confined to South Africa, and the brindled gnu (*C. taurina*) occurs in East Africa, its southern limit being the Orange River.

Goa, Portuguese settlement on the W. coast of India. Its length is 60 m., greatest breadth 40 m., and its area 1,400 sq. m. Palms (from which native spirits are distilled), mangoes, bananas, bamboo, sisso, cutch, and maura are the chief products. Salt and teak are obtained. Its archbishop is the head of the Roman Catholic Church in the East. In 1904 the imports amounted to £361,250, the exports to £105,260, and the transit trade to and from British India £1,020,225. (See INDIA, PORTUGUESE.) Pop. (1900) 475,513, of

whom more than half are Roman Catholics. The capital, Nova Goa or Panjim, a picturesque town, is connected by the Mormugao Railway (51 m.) with British India.

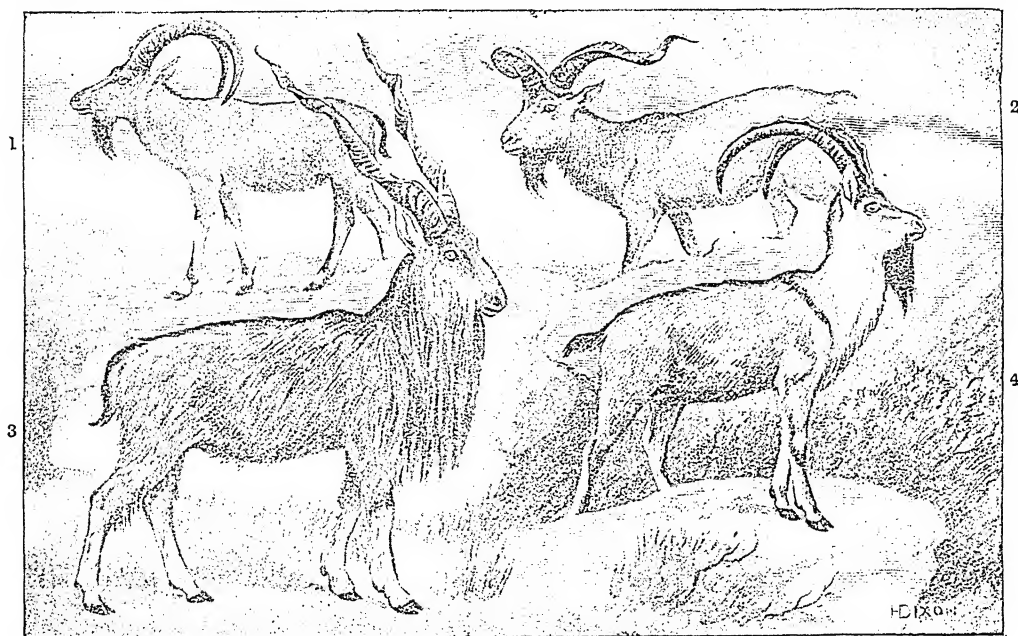
Goajira, peninsula in Colombia, S. America, between the Caribbean Sea and the Gulf of Venezuela, running N.E. for 100 m., and having an area of some 5,000 sq. m. The Goajira Indians are a sturdy, independent race, almost untouched by civilization.

Goalpara, tn. in Goalpara dist., Eastern Bengal and Assam, India, on the l. bk. of the Brahmaputra. Pop. (1901) 6,287. The

sheep, goats are typically mountain animals; but they are partial to the shoots and leaves of shrubs and trees, while sheep confine themselves more strictly to grass. As very typical examples of wild goats may be mentioned the ibex of the Alps, Himalayas, mountains of Arabia, etc.; the Persian goat, bezoar goat, or paseng (*C. agagrus*), the parent of the domesticated goats; the tur of the Caucasus; the Spanish goat or ibex.

Goats are useful principally for their milk, as a good she-goat will give from three to six pints of milk per day of similar taste to cow's milk. The Nubian goat is

Angora and the Kashmir goats are often confused together, but are in reality distinct. Both yield hair of beautifully silky texture, and both carry a second quality of coat which resembles wool. In the Angora goat the woolly portion of the coat is outside the hairy covering, but in the Kashmir goat the wool is next the skin. The Nubian goat carries short, black, twisted horns, the ears are pendulous, the legs long, and the coat of the female is extremely short. The Nepal goat is a variety of the Nubian. The Maltese goat is generally hornless, and is cream-coloured. The Syrian goat



Goats.

1. Ibex (*C. sinaitica*). 2. Markhor (*C. Falconeri*). 3. *C. Falconeri megaceros*. 4. Wild goat (*C. hircus agagrus*).

district has an area of 3,954 sq. m. Pop. (1901) 462,052.

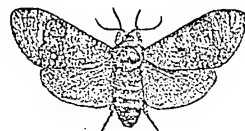
Goat. Goats, together with sheep, form the caprine section of the Bovidae. In the goats the horns are flattened from side to side, and either curve backwards or are spirally twisted. There is no gland beneath the eye, and if glands are present in the feet, it is only in the fore feet. The chin bears a more or less distinct beard, and the males have a singularly strong, rank smell. Goats are confined to the Old World, and are chiefly found in the mountain regions of Europe and Asia. Two species occur in N. Africa, and one in the mountains of S. India; but generally speaking, in Asia the Himalayas mark the southern limit. Like

said to yield as much as from three to four quarts per day of milk of superior richness.

The common goat is represented by many sub-varieties, which differ in the length of the hair, in colour, and in the shape of the horns. In the short-haired class (the English goat) the coat is thick and close, with an undergrowth of woolly character. Both sexes are horned, but in the male the horns are more developed. The colour is either white, gray, fawn, or black. The long-haired (or Irish) goat is more frequently swarthy red, although occasionally white or pied. The horns are large, corrugated, and pointed, and rise close together in parallel lines. The coat is shaggy, and the head large and ugly. The

has very long ears and very long hair, and its horns are erect and spiral. The skins of goats are utilized for gloves and in the production of leathers of fine texture and high value used in book-binding, etc.

Goat Island. See NIAGARA FALLS.



Goat-moth.

Goat-moth. The adult female is furnished with a long ovipositor, and, like her mate, is of

a brown colour. The eggs are laid in the crevices of the bark of trees, and the caterpillars which emerge bore into the wood with their strong jaws. They have a powerful and unpleasant smell, recalling that of the he-goat, whence the name of the insect. Larval life lasts for more than three years, the full-fed larva

ally emerges. The scientific name of the goat-moth is *Cossus ligniperda*; it occurs in Europe generally, including England, and in Western Asia.

Goat's Beard, the popular name given to plants belonging to the genus *Tragopogon*, a subdivision of the order Composite. The genus is distinguished by a

has earned for it the name of Johnnie-go-to-bed-at-noon. Several species of goat's beard are occasionally grown in flower gardens, the best being the purple-flowered *T. glaber*, from the Mediterranean countries. Much the most important species of *Tragopogon*, however, is *T. porrifolius*, or salsify.



Gobelins Tapestry: Reproduction of 'The Visitation' of Ghirlandajo. By E. Flament, 1874-6.

being three inches in length, and as thick as a man's finger. If, as frequently happens, one tree is infested by many caterpillars, the wood becomes riddled by their burrows, and entirely destroyed. When full-fed, the larva constructs a tough cocoon of wood chips, from which the moth fin-

simple involucre composed of long scales, a feathery, downy pappus shaped like a shallow goblet, and a rough, beaked front. The yellow goat's beard (*T. pratensis*) is a fairly common British plant, with long, undivided leaves and a glaucous appearance. The early-closing habit of its flowers

Goat's Rue. See GALEGA.

Goatsucker. See NIGHTJAR.

Gobelins, a French family which gave its name to the well-known manufactory of tapestry at Paris. Settling in the capital (Faubourg St. Marcel) in the 15th century, Gilles Gobelin established dyeworks, to which a

tapestry factory was soon added. The tapestry works were bought (1662) by Colbert for Louis XIV. The industry, renewed at the restoration of the Bourbons, received a fresh impulse between 1870 and 1880 owing to the use of special designs prepared by leading artists, in place of the former method of copying pictures. The factory gives its name to a shade of blue (known as 'Gobelin blue') appearing frequently in the tapestry. Another manufactory of the tapestry is in operation at Beauvais. See Gerspach's *La Manufacture Nationale des Gobelins* (1892).

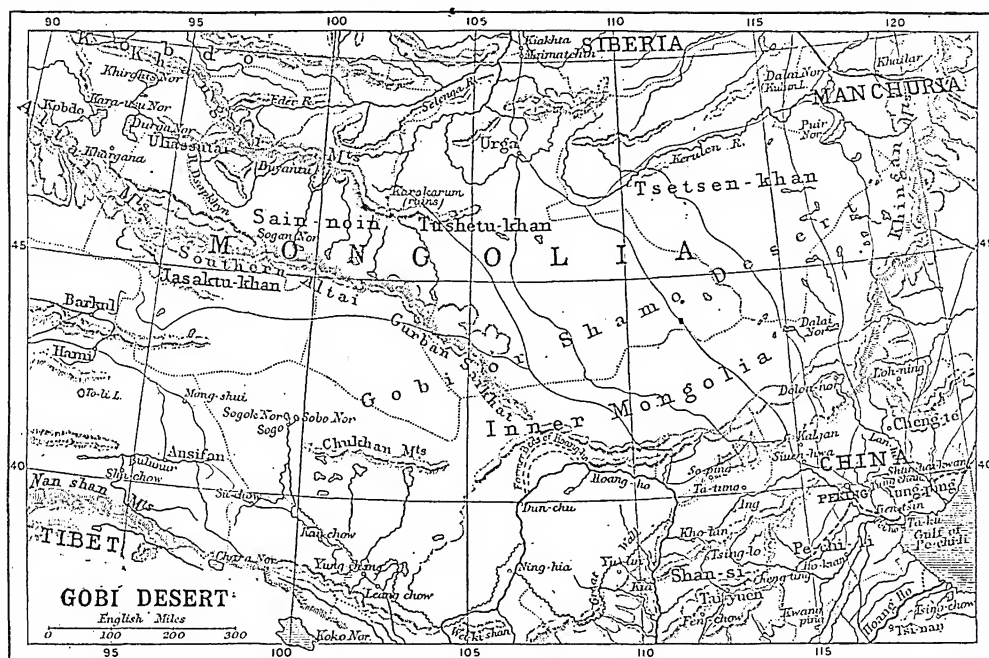
Gobi Desert, the SHAMO or HAN-HAI of the Chinese, stretches

sham on the s., and by the Mongolian Altai on the w. It has a mean elevation of over 3,700 ft. It is studded with loftier masses of land of rocky formation, representing ancient islands of the Han-hai.

The central section of the desert is bordered by the Mongolian Altai on the N., by the Chu-Khun-Shan on the s., by the Lukchun-Hami depression on the w., by the Golbyn 'Strait' on the e. The mean elevation is over 3,800 ft. The Ala-shan is essentially a part of this Central Gobi region; and the sandy steppes of Southern Zungaria and the country of Ordos may be considered as outlying portions of this section.

owe our most valuable and accurate information of these regions. See Prjevalsky's *From Kuja across the Tian-shan to Lop-nor* (trans. Delmar Morgan, 1879), and *Mongolia*, etc. (trans. 1876; Richthofen's *China* (1877-83); and C. W. Campbell's 'Journeys in Mongolia,' in *Geog. Jour.* (Nov. 1903).

Goblin, an imaginary being supposed to haunt dark or remote places. The lutin or goblin of Normandy hardly differs from the domestic spirit of Scandinavia and Germany. The German kobold has a similar derivation, and is the same being as the Scottish brownie and English hobgoblin. The kobold lives with families he



continuously from the Pamirs to the Great Khingan range and the w. frontier of Manchuria. The w. part, between the Yarkand Daria (Tarim) and Lob-nor, is usually known as the Takla Makan Desert; to the e. of Lob-nor European geographers name it the 'Great' Gobi. A sandy soil, heavily charged with alkalis, is the general characteristic. The Chinese term 'sea of sand' (Han-hai) is really applicable only to certain areas; even in the middle of the desert, especially in its e. portion, a certain amount of thin herbage is often to be found. The Great or Eastern Gobi is bounded by the Kentei chain on the N., by the Great Khingan mountains on the e., by the In-

The Gashiun-Gobi or Gobi of Hami (Khamil) is composed of a depressed, marshy, and sandy desert region to the s., and of an elevated region to the N., and rising to 6,500 ft. in parts. Nearly the whole of this vast region (the Gobi in its widest sense) has inland drainage. Of the inland waterways by far the most important is the Tarim, in the Takla Makan region (Chinese Turkestan). The total area must be at least 300,000 sq. m.; extreme length about 1,800 m.; average breadth about 400 m. To the explorations of Ney Elias, Prjevalsky, Kozlov, the brothers Grum-Grjimallo, Roborovsky, Pievstov, Bogdanovich, and more recently to those of Dr. Sven Hedin, we

approves of, first putting them on trial by bringing chips and sawdust into the house, and throwing dirt into the milk-vessels. If this is not resented he proves a good friend. Robin Goodfellow is a domestic spirit or goblin distinguished by roguery and sportiveness.

Gobo, the name given in Japan to the common burdock (*Arctium Lappa*). See BURDOCK.

Goby, a name applied to the species of the fish genus *Gobius*, several of which are common in British seas. All are small fish, carnivorous in habit, and haunting rocky coasts, for which they are specially fitted, owing to the fact that the pelvic fins form a suction disc, enabling the fish to

withstand the force of the waves. Some species live in brackish water, and others have become completely adapted for life in fresh water. The body is covered with scales, and of the two dorsal fins, the anterior is usually furnished with six spines. The commonest British species is *G. niger*. Some three hundred species have been described.



Goby (*G. niger*).

Goch, tn., prov. of Rhineland, Prussia, 32 m. by rail N.W. of Krefeld, was in the middle ages a centre of the linen trade. Pop. (1900) 9,101.

God. See THEISM.

Godalming, munic. bor., 4 m. s. of Guildford, Surrey, England. Charterhouse School (570 boys), founded in 1611 at Aldersgate, London, was removed here in 1872. Pop. (1901) 8,748.

Godard, BENJAMIN LOUIS PAUL (1849-95), French musician, was born in Paris. He composed several operas, pianoforte works, and violin sonatas, besides chamber music and many songs, including *Ninon* and *Je ne veux pas d'autre chose*, which became very popular. He died at Cannes. His chief works are the dramatic cantata *Le Tasse* (1878), and the operas *Pedro de Lalamca* (1884), *Jocelyn* (1888), *Dante* (1890), *La Vivandière* (posthumous, 1896); also *Symptome Legendaire*.

Godavari, (1.) District, Madras Presidency, India, with an area of 7,837 sq. m., and population (1901) of 2,301,759. The cigars made from tobacco grown on the islands (*lankas*) of the river Godavari are known in England as *lankas*. Chief town, Cocanada. (2.) The longest river in the Deccan, India; has its source in the W. Ghats, flows E., then S.E., and discharges by seven mouths into the Bay of Bengal. The Godavari is one of the twelve sacred rivers of India, and is about 900 m. in length.

Goddard, ARABELLA (1836), pianist, was born at St. Servan, in Brittany, of English parentage. She made her début in London in 1850, and afterwards played with success on the Continent; gained the gold medal of the Philharmonic Society in 1856, and from 1873-6 made a tour through America, Australia, India, and China. Among her last appearances was that at Sir Arthur Sullivan's concerts at the Paris Exhibition of 1878.

Godefroy, FREDERIC (1826), French lexicographer, born at Paris, compiled a *Lexique Comparé de la Langue de Corneille et*

de la Langue du XVII^e Siècle en Général (1862), and wrote *Histoire de la Littérature Française depuis le XVI^e Siècle* (9 vols. 1859-81), and *Dictionnaire de l'Antienne Langue Française* (10 vols. 1880-92). See Traversier's *F. Godefroy* (1898).

Goderich, tn., Huron co., Ontario, Canada, the chief Canadian shipping port on Lake Huron; is the centre of the Canadian salt industry, and has lake fisheries. Pop. (1901) 4,158.

Godesberg, tn. and summer resort, prov. Rhineland, Prussia, on the l. bk. of the Rhine, 4 m. by rail s. of Bonn. It possesses a hydropathic establishment and mineral springs. Pop. (1900) 8,927.

Godet, FRÉDÉRIC (1812-1900), Swiss theologian, was born at Neuchâtel. He was tutor to the Crown Prince Frederick William of Germany, but became professor of theology at Neuchâtel (1850). Leaving the Established Church in 1873, he was professor in the Theological College of the Evangelical (Free) Church in the same canton till 1887. He has won wide recognition from his *Commentaire sur l'Evangile de St. Jean* (3rd ed. 1881-5; Eng. trans. 1877); *Commentaire sur l'Evangile de St. Luc* (3rd ed. 1888-89; Eng. trans. 1875); and commentaries on the Epistle to the Romans (2nd ed. 1883-90; Eng. trans. 1881); and on 1 Corinthians (1886-7). He also published *Histoire de la Réformation et du Refuge dans le Pays de Neuchâtel* (1859); *Etudes Bibliques* (Eng. trans. under title *Old Testament and New Testament Studies*; 2nd ed. 1882); and *Introduction au Nouveau Testament* (1893; Eng. trans. 1894).

Godetia, a sub-genus of flowering plants now included in *Enothera*. They are very free-flowering, hardy annuals, being large cup-shaped flowers, usually white or pink in colour. They are of easy culture.

Godfather and Godmother. See SPONSORS.

Godfrey of Bouillon (c. 1061-c. 1100), one of the leaders of the first crusade, was born at Baisy in Brabant. After serving under the Emperor Henry IV. at the battle by the Elster (1080), and in the campaign of 1083 against Rome, he was created Duke of Lower Lorraine. Leading to Palestine one of the six armies of the first crusade, Godfrey distinguished himself especially at the siege of Jerusalem, and in 1099 was elected king of the city. He died soon after inflicting a crushing defeat upon the Saracens on the plain of Ascalon. See De Hody's *Godefroid de Bouillon* (1859), and Froboese's *G. von Bouillon* (1879).

Godhra, chief tn. in the dist. of Panch Mahals, Bombay Presidency, India, 50 m. N.E. of Baroda. Pop. (1901) 20,915.

Göding, tn., Moravia, Austria, on the March, 50 m. by rail S.E. of Brünn; manufactures tobacco, sugar, and glass, and mines lignite. Here is an imperial castle. Pop. (1900) 10,231.

Godiva, LADY OF COVENTRY, subject of a legend which has been treated by Leigh Hunt and Tennyson. She was the wife of Leofric, Earl of Mercia; and about 1040, in order to save Coventry from the exactions of her husband, consented to ride naked through the streets. A window in St. Michael's Church in Coventry commemorates the deed, and the impertinent curiosity of 'Peeping Tom of Coventry.'

Godkin, EDWIN LAWRENCE (1831-1902), American publicist, was born at Moyne, Co. Wicklow, Ireland. During the Crimean war he was correspondent for the *Daily News*. Proceeding to the United States in 1856, he founded (1865) the *Nation* (the *Evening Post* since 1881) newspaper in New York. In 1871 he contributed a volume on *Government* to the American Science Series.

Godna, or REVELGANJ, munic. tn., Saran dist., Bengal Presidency, India, situated above the junction of the Ganges and Gogra. Pop. (1901) 9,765.

Göddölö, tn., Pest co., Hungary, 23 m. by rail N.E. of Budapest, with a royal country seat and park. Pop. (1900) 5,875.

Godolphin, SYDNEY, EARL OF (1645-1712), English statesman, born at Godolphin Hall, Cornwall. After the restoration he was made page of honour to the king (1662), and (1672) groom of the bedchamber. His first diplomatic mission was to negotiate, between the Duke of York and the Prince of Orange, a proposal (which was unsuccessful) for combined war against France. In the following year (1679) Godolphin was appointed lord of the Treasury, and, with Lord Hyde and the Earl of Sunderland, was entrusted with the chief management of affairs. Later he was made one of the principal secretaries of state, but returned to be head of the Treasury. He remained in office on the accession of James II., and was also chamberlain to the queen. After the accession of William III. he was one of the lords of the Treasury, being later made first lord (1690). On the accession of Queen Anne (1702) he was made lord high treasurer in the following exclusively Tory administration. He retained the office of lord high treasurer till the influence of Mrs. Masham and Harley replaced that of the Duke and

Duchess of Marlborough. By this time he had openly attached himself to the Whigs. He and Marlborough obtained Harley's dismissal; but Harley did not rest till he had fomented trouble, and Godolphin was eventually dismissed (1710). Godolphin's administration was made glorious by Marlborough's victories, and conspicuously so by his securing the union with Scotland. See *Life* by Hugh Elliot (1888).

Godoy y Alvarez de Faria, MANUEL DE, DUKE OF ALCUDIA (1767-1851), Spanish statesman, was born at Badajoz. By his handsome presence and agreeable manners he captivated the Spanish queen, and was made prime minister by Charles IV. (1793). For arranging the treaty of Basel he was created Prince of Peace (1795). Together with France he made war on England, and was hated by the people as the cause of the defeat at Trafalgar, as well as for his marriage with a Bourbon princess during the lifetime of his wife. Rescued from the mob by Murat, he helped to persuade Charles IV. to abdicate at Bayonne (1808). He died in exile.

God Save the King, the national anthem of England, first publicly performed in 1740, to celebrate the capture of Porto Bello in S. America by Admiral Vernon, when it was sung by Henry Carey, author of *Sally in our Alley*, as his own composition as regards both words and music. The tune was adopted in France in 1776, and was afterwards used as the Danish, Prussian, and German national air. See Cummings's *God Save the King* (1902).

God's Truce (*Treuga Dei*) was the name given to the successful effort by the church to mitigate the evils of the anarchy into which Europe fell after the dissolution of Charlemagne's empire. The movement originated (1027) in the south of France, but it soon spread over western Christendom, and was adopted as an imperial law by the Emperor Henry III. The main features were—no fighting from Wednesday evening till Monday, or during Advent or Lent, or on principal saints' days; pilgrims, priests, women, agriculturists, and merchants were specially exempt from the ravages of war. There is less mention of the truce after the 13th century. See Semichon's *La Paix et la Trêve de Dieu* (1857).

Godthaab, chief tn. of Greenland, on the S.W. coast, in lat. 64° 10' N.; has a seminary for native catechists. Pop. about 1,000.

Godunov, BORIS. See BORIS GODUNOV.

V.—17

Godwin (c. 990-1052), Earl of the West Saxons, was the father of the last English king of native stock, Harold. Under the rule of Canute he became an earl (1016). In 1042 he took a prominent part in raising Edward the Confessor to the throne, his daughter Edith being married to the king, who, however, eventually banished Godwin and his sons (1051). Godwin soon returned, enlisted the willing people in his cause, and forced the king to restore him to all his honours.

Godwin, FRANCIS (1562-1633), bishop of Llandaff and Hereford, born at Hannington in Northamptonshire. He was consecrated bishop of Llandaff (1601), whence he was translated to Hereford (1617), where he died. Godwin wrote on church history, his principal book being *Catalogue of the Bishops of England* (1601). His posthumous work, *The Man in the Moone* (1638), is believed to be the source whence Swift derived the suggestion of *Gulliver's Travels*.

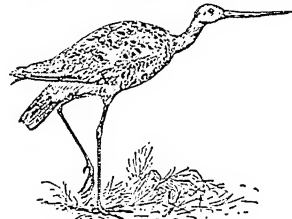
Godwin, MARY WOLLSTONECRAFT (1759-97), English author, born at Hoxton, London. Mary became first a teacher, and later was literary adviser to Johnson, a London bookseller, who published her novel *Mary*. Her *Vindication of the Rights of Women* (1792) was an able plea for the equality of the sexes and the better education of women. In the same year she went to Paris, where she became acquainted with a Mr. Imlay, an American, to whom she bore a daughter. Subsequently, after an attempt to drown herself in the Thames owing to Imlay's neglect, she married William Godwin, who shared her views; their daughter was Shelley's second wife. She also wrote (unfinished) *Historical and Moral View of the French Revolution* (1794); *Letters [from] Sweden, Norway, and Denmark* (1796); *Letters to Imlay* (new ed. 1879). See *Memoirs* of her by Godwin (1798), Mrs. Pennell (1885), and Rauschenbusch-Clough (1898).

Godwin, WILLIAM (1756-1836), English author, was born at Wisbech in Cambridgeshire. From 1783 till his death he led the life of a man of letters. He made the acquaintance of Thomas Paine, Horne Tooke, Mackintosh, Wordsworth, Southey, Coleridge, Lamb, and Shelley. Godwin formed a connection with Mary Wollstonecraft; both ostentatiously denied the importance of legal ties, except in the interests of issue. The child of this union, at whose birth her mother died, formed in 1812 a similar union with Shelley, which was likewise after legitimated. In

1833 he was given a sinecure office in the Exchequer. His best-known works are *An Enquiry concerning Political Justice* (1793), and *The Adventures of Caleb Williams* (1794); but perhaps his most useful productions are the *History of the Commonwealth of England* (1824-8), and his charming *Fables* (1805) and other children's books published under the name of 'Baldwin.' See *William Godwin*, by C. Kegan Paul (1876).

Godwin-Austen, peak (28,265 ft.), Mustagh Range, Western Himalayas, N. Kashmir, India, in 35° 53' N. lat., 76° 34' E. long.; is the second highest peak in the world. On the Indian Survey maps it is designated K².

Godwin-Austen, HENRY HAVERSHAM (1834), English military surveyor, was born at Teignmouth. He served in the Burmese war of 1853, and in 1874 accompanied the Bhutan field force as surveyor. He has rendered great service to science by his work *On the Land and Fresh-water Mollusca of India* (1882-99), and by his surveys in Kashmir (1857), Ladakh (1862), and the Eastern Himalayas.



Godwit (*L. limosa*).

Godwit, a general name for the members of the bird genus *Limosa*, a limicoline genus related to the sandpipers. The black-tailed godwit (*L. belgica*) used to breed in the eastern counties of England, but now only occurs as a migrant. The bar-tailed godwit (*L. lapponica*) likewise occurs as a migrant in Britain. The godwits are shore birds, having long legs and elongated and slightly up-curved beaks. A large portion of the tibia is bare of feathers, and the claw of the third toe is comb-like. They are confined to the Arctic and temperate portions of the northern hemisphere, but undertake extensive migrations southward in winter. Like many of their allies, they are valued as food.

Goedeke, KARL (1814-87), German historian of literature, was born in Celle. In 1855 he commenced his *Grundriss zur Geschichte der deutschen Dichtung* (1857-81; new ed. 1884-6), which was carried further by Goetze after the author's death. In 1873

he became professor of the history of literature at Göttingen. Goedeke's other works, which appeared under the pseudonym of Karl Stahl, include *König Kodrus* (1839); *Novellen* (1840); *Deutsche Dichter von 1813-43* (1844); *Edelsteine aus den neuesten Dichtern* (1851); *Deutsche Dichtung im Mittelalter* (new ed.

of Arabic there. De Goeje has edited an edition of *Tabari* (1879-92), and compiled vols. iii.-v. of *Catalogus Codicum Orientalium Bibliothecae Lugduno-Batavae* (1865-73). His numerous works include *Liber Expugnacionis Regionum, Auctore al-Beladsori* (1866); *Edrisi's Description de l'Afrique et de l'Espagne* (1866),



Mount Godwin-Austen (K²) from Throne Glacier.
(By permission, from Sir Martin Conway's *Climbing and Exploration in the Karakoram Himalayas*.)

1871); *Goethe und Schiller* (1859); *Goethe's Leben und Schriften* (1877). He also edited the critical edition of Schiller's *Sämtliche Werke* (15 vols. 1867-76).

Goeje, MICHAEL JAN DE (1836), Dutch Arabic scholar, born at Dronrijp, Friesland. He studied under Dozy at Leyden, and in 1866 was appointed to the chair

in collaboration with Dozy; *Fragmenta Historicorum Arabicorum* (1869-71); *Bibliotheca Geographorum Arabicorum* (1870-92); *Diwan Poëta Moslim ibn-al-Walid* (1875); *Mémoires d'histoire et de Géographie Orientale* (1862-86); *Selections from the Annals of Tabari* (Semitic Library, 1902).

Goerce, isl. of the Netherlands, prov. S. Holland.

Goes, or TER GOES, tn., Netherlands, prov. Zeeland, 16 m. by rail N.E. of Flushing (Vlissingen). Pop. (1899) 6,923.

Goes, BENTO DE, or BENEDICT GOEZ (1562-1607), Portuguese Jesuit missionary, born at São Miguel in the Azores. Disguised as an Armenian merchant, he started from Lahore in 1603, bearing letters from the enlightened emperor Akbar to the ruler of Cathay. In 1605 he arrived at So-chou (in about 95° E. long. and 40° N. lat.), by which time he was convinced that Cathay was China. Here he died, possibly poisoned by the Mohammedans. An English version, *The Travels of B. de Goes from Lahor to China*, was published in 1745.

Goes, HUGO VAN DER (c. 1420-82), Flemish painter, was born at Ghent. From Van Eyck he learned the art of painting in oils, and first attracted attention by *The Meeting of David and Abigail*.

Goethe, JOHANN WOLFGANG (1749-1832), German poet, was born at Frankfort-on-Main. Goethe's life until 1775 is described in his *Dichtung und Wahrheit* (1811, 1812, 1814, 1833). The French occupation (1759) of Frankfort led to an early acquaintance with the drama and the art of France. Klopstock's *Messias* he read eagerly with his sister Cornelia. His father wished him to take up law, and he accordingly went to the University of Leipzig in 1765. There he wrote some lyrics in the Anacreontic manner, and two short plays, *Die Lärche des Verliebten* (1767) and *Die Mitschuldigen* (1768), quite conventional in treatment, and showing strong French influence. In the summer of 1768 he fell ill, and had to return home. In 1770 he went to the University of Strassburg to resume his legal studies. Here he met Herder, who inspired him with his own enthusiasm for Shakespeare and for popular poetry. His love for Friederike Brion at Sessenheim roused in him the lyric spirit; *Willkommen und Abschied* is the best-known poem of this period. The winter of 1771-2 he spent at home, working at the drama *Götz von Berlichingen*; it was published in 1773. It is very irregular in construction, a true child of the 'storm-and-stress' movement, in point of technique in striking contrast to Lessing's early dramatic attempts. The summer of 1772 Goethe spent at Wetzlar, the seat of the imperial law courts; his hopeless love for Charlotte Buff, whom he met there, supplied some of the materials for *Die Leiden des jungen Werthers* (1774), a novel which owes much to

Rousseau's *Nouvelle Héloïse* and something to Richardson's novels. It quickly made him famous, even beyond Germany. The emotional and sensitive Werther, a victim of his environment, was the typical young man of the 'storm-and-stress' period. In addition to these works Goethe had begun his *Faust*, destined to accompany him throughout life; and had written the plays *Clavigo* (1774), based on the *Mémoires* of Beaumarchais, and *Stella* (1775), the plot of which is taken from the mediæval tale of the Count von Gleichen. Some notable lyrics were also written at Frankfurt; the best were addressed to Elisabeth (Lili) Schönmemann, to whom he was engaged for a short time. A momentous turning-point in his career was the invitation to Weimar in 1775: he was at first the guest of Duke Karl August, but soon received one appointment after another. Between 1775 and 1786 he wrote some lyrics, in part inspired by his friend Charlotte von Stein; several longer poems — *Ilmenau* (1783), *Zueignung* (1784), and *Hans Sachsens poetische Sendung* (1776) — which served to draw attention to the almost forgotten Meistersinger. For the court festivals he wrote several short plays; and the early drafts of *Iphigenie*, *Tasso*, and *Egmont* also belong to this period. *Faust* was carried further, and *Wilhelm Meister* was begun. The more notable men with whom he associated at Weimar were Wieland, Musäus, and Herder. To escape from the fetters of his position, and to carry out a long-cherished desire, he went to Italy in 1786; the incidents of his stay there he has told in his *Italianische Reise* (1817). At Rome he devoted himself to the study and practice of art; the painters Tischbein and Angelika Kaufmann were among his friends. He now finally subdued all tendencies to excess in life and art, and attained the Greek ideal of the golden mean of reposeful harmony. In this spirit he gave to *Iphigenie* its final form (1787); his chief source is Euripides, but the characters have lost what was specifically Greek, and they act from different motives. He also completed the drama *Egmont* (1788), in which he deals somewhat freely with a historical figure in the revolt of the Netherlands. On Goethe's return (1788) to Weimar he surrendered almost all the offices he had held. In 1788 he wrote, and in 1792 issued, his *Römische Elegien*. In 1789 the final version of the drama *Tasso* was completed. Goethe himself described his hero as an intensified Werther, and insisted (with good reason) that much of his own life and feelings

had passed into the play. In his own heart there had been a long struggle between the high-strung sensibilities of the poet (Tasso) and the conscientious obedience to the claims of a public life (Antonio). In the following year were published his *Venetianische Epigramme*, written at Venice, and often suggesting the epigrams of Martial. Also in 1790 appeared *Faust, ein Fragment*. Goethe had put to

pravity under the *ancien régime*; and *Der Bürgergeneral* (1793). In 1793 he also wrote in hexameter verse the mediæval beast-epic *Reineke Fuchs* (Reynard the Fox); it is based on a prose version by Gottsched, and shows no original developments. He gave much time to scientific studies, in the course of which he made some important discoveries in comparative anatomy and vegetable physiology, and combated Newton's



Bust of Goethe.

gether such scenes as were completed, and did not intend to carry out the whole; it was Schiller who urged him to take it up again. The first part was issued in 1808, the second not until 1833. Goethe showed the interest aroused by the French revolution in several plays of slight intrinsic importance—*Der Grosskopf* (1792), which deals with the notorious necklace affair, and presents a picture of the de-

theories in optics. In 1794 he first came to have more than a superficial acquaintance with Schiller; he had been instrumental in appointing him professor of history at Jena in 1789. Schiller invited him to contribute to *Die Horen*, a literary journal he proposed to issue; and the letter in which he did so starts the noteworthy correspondence between Germany's two greatest poets, who for the next ten years

till Schiller's death) were united by the ties of closest friendship, and stimulated and criticised each other in the most fruitful way. In 1795 and 1796 Goethe contributed to *Die Horen* *Wilhelm Meisters Lehrjahre*, the 'Odyssey of a man's education,' the history of a growing character in the form of a novel. The discussion of Shakespeare's *Hamlet*, the *Bekenntnisse einer schönen Seele*, and other digressions, add to the interest but impair the balance of the novel; the conclusion also is forced. The sequel, *Wilhelm Meisters Wanderjahre* (i. 1821; ii. 1829), is even more irregular in treatment; but it contains a great store of wisdom, the mature Goethe's ideas on education, on statecraft, and indeed on the whole conduct of life. In 1796 Goethe and Schiller wrote between them some six hundred *Xenien*, pithy sayings, in which they expressed their smiling contempt for many of the literary and philosophic tendencies of the time. Goethe also wrote *Alexis und Dora*, perhaps the most perfect expression he ever gave to the Greek spirit. In 1797 both poets wrote ballads, Goethe's including *Die Braut von Korinth*, *Der Schatzgräber*, *Der Gott und die Bajadere*, and *Der Zauberlehrling*. He also translated the autobiography of Benvenuto Cellini; but the most important work was his *Hermann und Dorothea*, the finest and most perfect work of art he produced. It is an epic poem in nine cantos, in hexameter verse. Its success recalled that of *Werther*. In 1798 Goethe began to edit *Die Propyläen*, a magazine mainly devoted to the arts; he wrote the fragment of an epic *Achilleis*, and the beautiful elegy *Euphrosyne*, on the death of the young actress Christiane Becker. In 1799 he began *Die natürliche Tochter*, intended to be a trilogy; but only the first part was completed (1803). Little beyond a few lyrics and *Gesellige Lieder* was written in the following years. In 1805 he composed his interesting work on *Winkelmann und sein Jahrhundert*. Schiller's death in this year was a terrible blow; Goethe has set up a noble monument to his friend in the *Epilog zu Schillers Glocke*. Of his later works the following (in addition to those already mentioned) are the most important: *Farbenlehre* (1808-10), containing his views on optics, which to his great disappointment did not commend themselves to contemporary scientists; *Wahlverwandtschaften* (1809), a psychological, even a pathological, novel, remarkable for its skilful composition; *Des Epimenides Erwachen* (1815), written by re-

quest as a welcome to the Prussian troops; *West-Oestlicher Divan* (1819), a collection of lyrics modelled on the *Divan* of Hafiz, and combining Oriental imagery and rhythm with German feeling, which has sometimes all the intensity and passion of a young man. In 1824 Goethe edited the letters which had passed between himself and Schiller.

For full bibliographies see Hirtzel's *Verzeichnis einer Goethebibliothek* (last ed. 1884); English books are enumerated in Sime's *Goethe* (1888). Editions of Goethe's works:—The last in his lifetime is that in 40 vols. (1827-31); Hempel's ed. in 36 vols.; ed. in 36 vols. in Kürschner's *Deutsche Nationalliteratur*. The splendid Weimar edition was begun in 1887. The Poems have been edited by G. von Loeper (1884-7). There are many editions of his Letters; see Fr. Strehlke's *Goethes Briefe, Verzeichnis* (1882-4). Conversations: Biedermann's *Goethes Gespräche* in 10 vols. (1889-96); Eckermann's *Gespräche mit Goethe* (6th ed. 1885). Biographies, etc.: H. Grimm's *Goethe* (5th ed. 1894; Eng. trans. 1880); W. Scherer's *Aufsätze über Goethe* (1886); Heinemann's *Goethe* (1895); W. von Biedermann's *Goetheforschungen* (1879, 1886); V. Hehn's *Gedanken über Goethe* (2nd ed. 1888); R. M. Meyer (2nd ed. 1895); Bielschowsky (2nd ed. 1900; Eng. trans. 1906, etc.); Düntzer (1883; Eng. trans. 1902); Carlyle in *Miscellaneous Essays*; G. H. Lewes's *The Life of Goethe* (1855); J. R. Seeley's *Goethe reviewed after Sixty Years* (1894); in French—Caro's *La Philosophie de Goethe* (1880); E. Lichtenberger's *Etudes sur les Poésies Lyriques de Goethe* (1882).

Goethea, a genus of small evergreen shrubs of Brazil, belonging to the order Malvaceæ. They are showy greenhouse plants.

Goetz von Berlichingen. See BERLICHINGEN.

Goffe, WILLIAM (?1605-70), English Parliamentarian, born in Sussex. He belonged to the 'New Model,' and as one of the judges signed the death-warrant of Charles I. He fought at the battles of Dunbar (1650) and Worcester (1651), and helped to turn out Barebone's Parliament (1653). Not being included in the Act of Indemnity, he escaped to Boston, Massachusetts, and spent the rest of his life in America.

Gog and Magog, names occurring several times in the Scriptures, and also the names given to the famous figures of giants in the London Guildhall. Magog is referred to in Genesis as a son of Japheth; Ezekiel speaks of Gog, prince of Magog; Gog and Magog are mentioned also in

the Revelation. The Guildhall figures bearing these names were burned in the great fire (1666), and new ones were constructed in 1708.

Gogol, NIKOLAI VASILIEVITCH (1809-52), Russian author, was born at Sorochintsi in Poltava. After a short term as a government clerk, he produced his first famous work, *Evenings in a Farm near Dikanka* (1831-4). His *Mirgorod* (1834) included *Taras Bulba* (Eng. trans. 1888), dealing with the exploits of the Zaporogian Cossacks. *Old-World Gentlemen* exemplifies his power of depicting Russian life with that vigour, truth, and humour which have made his works popular. His famous comedy, the *Government Inspector* (1836; Eng. trans. by Hart Davies in 1890, and by Sykes in 1892), exposed the rottenness of official life in the provinces. Gogol's greatest work, however, is his novel *Mert-ruiya Dushi* (Eng. trans., *Dead Souls*, 1886), a part of which appeared in 1842, the second part being burned unpublished by him just before his death. After lecturing for a couple of years at St. Petersburg on history, and living abroad, chiefly at Rome (1836-46), Gogol returned to Russia, and died at Moscow. A complete edition of his works was published at Moscow (1856-7). See P. Kulisch's *Aufzeichnungen über das Leben N. V. Gogols* (1856), and Zabel's *Russische Literaturbilder: Nikolai Gogol* (1899).

Gogra, or GHAGRA, chief riv. of Oudh, India, rises at an alt. of 13,000 ft. in the Himalayas, flows s.e. then s. through Nepal, where it is known as the Karnali or Kauriala, and finally joins the Ganges just above Chapra. The river, which is about 600 m. in length, is navigable almost to its source.

Goil, LOCH, arm of the sea branching off Loch Long, Argyllshire, Scotland, 6 m. long. The mountains of Argyll's Bowling Green rise abruptly from its E. shores; Ben Bheula (2,557 ft.) and several small heights flank the W. side.

Goitre (Fr.), or BRONCHOCELE, sometimes called 'Derbyshire neck,' is a simple (i.e. non-malignant) enlargement of the thyroid gland; and it may be cystic, or fibrous, or a hypertrophic increase of the glandular substance. The enlargement may cause only a slight swelling of the neck, or it may amount to a pendulous growth weighing several pounds. Cretins are frequently the offspring of goitrous parents, and themselves often have a goitre. Goitre, however, may exist apart from cretinism. It is prevalent in those mountainous districts

where cretinism is found, though by no means confined to them. Its etiology is not thoroughly understood, but it is associated with a certain geological formation, characterized by the presence of magnesian limestone in the soil and in the drinking water. Causes which lower the general nutrition predispose to goitre, and it sometimes follows pregnancy. There is a belief that the habit of carrying heavy weights on the head predisposes to the disease, while the low barometric pressure of the mountainous districts where it is commonest is believed to be a factor in its causation. Goitre does not often end fatally.

Treatment includes the avoidance of the known causes. In India, where goitre is common in certain districts, great success has been claimed for inunctions of biniodide of mercury over the swelling, after which the patient is made to expose the neck for several hours to the sun. Some surgeons advise the entire removal of the goitre by operation; but this must be followed by continued administration of thyroid gland, in order to prevent the onset of myxedema, which necessarily follows complete deprivation of thyroïdin. The goitre is also frequently removed in part, for a small remaining portion of the thyroid is enough to prevent myxedema. Another operation is that of 'operative dislocation,' or shifting of the gland to avoid the effects of pressure. In a considerable number of cases, division of the narrow isthmus of an enlarged thyroid is followed by marked improvement, not only in pressure symptoms, but in the condition of the gland itself.

EXOPHTHALMIC GOITRE, 'GRAVE'S DISEASE,' or 'BASEDOW'S DISEASE.' The three symptoms of exophthalmic goitre are: (1) swelling of the thyroid gland, (2) irregularity of the heart's action (palpitation and tachycardia), and (3) protrusion of the eyeballs. Sir William Stokes says that the symptoms are developed in that order. Others hold that the disease may be present without swelling of the thyroid. It is far more common among women than among men, and develops usually before the age of thirty. Its causes are imperfectly known, but it often follows nervous shock or great mental distress, is commonest in nervous subjects, and seems to be, to some extent, hereditary. The eyes protrude and become staring as the disease increases. The eyelids are thickened, and when the sufferer looks downward the eyeball moves faster than the eyelid, with the result that a rim of white shows above the down-

cast eyeball. The goitre varies much in size, not only in different cases, but at different times in the same case. Death may result from heart-failure or from pressure of the enlarged thyroid upon important structures.

Treatment.—Success has been claimed for all the following modes of treatment: complete or partial removal of the enlarged gland; section of the cervical sympathetic nerve on both sides of the neck; ligature of some or of all the arteries to the thyroid gland; electrolysis; the injection of iodoform. Non-operative methods are: the administration of extracts of thyroid gland, or thymus gland, or suprarenal bodies; simple, complete rest, and careful dieting, sometimes with Nauheim baths or mercurial purgatives. Strophanthin has been used alone, apparently with success by some. Intestinal antiseptics are advocated by others who believe in a ptomaine origin. Picrotoxin and cacodylate of sodium are other drugs employed, apparently with benefit.

Gok-Cha, or **SEVANGA**, lake of the Minor Caucasus, crossed by 40° 25' N. lat. and 45° 25' E. long., lies 6,340 ft. above sea-level. It is 45 m. long, with a maximum breadth of 24 m., and covers an area of about 530 sq. m. Its greatest depth is 277 ft. On an island in the N. part of the lake stands the Sevanga monastery.

Golcar, par. and tn., W. Riding of Yorkshire, England, 3 m. S.W. of Huddersfield; manufactures woollen goods. Pop. (1901) 9,280.

Golconda, a ruined city in the Nizam's dominions, India, 7 m. W. of Haidarabad city; once the capital of the kingdom of the same name. The diamonds for which it was once famous were found in the S.E. of the Nizam's territory, and were cut and polished here.

Gold (Au, 197.2) is a metallic element that has been prized from the earliest times on account of its being found free, and because of its value and unalterability. It is widely distributed in nature, being found in all parts of the globe, occurring principally in rock formations or in alluvial deposits. The latter, which were practically the only sources of gold supply until recent years, are known as 'placers,' and may be shallow, of recent origin and near the surface, or deep, ancient, and covered over by subsequently deposited rock. In placers the gold is free, and almost pure or slightly alloyed with silver, and is present in rounded particles, varying in size from minute grains to considerable nuggets, mixed with much gravel, sand, or clay, having been removed from its original location by the action

of water and deposited where subsequently found. In Great Britain gold is found in river sands in Wales, Scotland, and Ireland, though scarcely to a paying extent. In Europe the only important alluvial deposits are in the Urals, whilst those of Siberia are the chief in Asia. In Africa there are no deposits of note at present, though those of the Gold Coast and Abyssinia were formerly important. In America the Californian deposits were the cause of the 'rush' of 1849; but of these the shallow, rich, and easily-worked ones are exhausted, and the poorer and more inaccessible placers are now being attacked. In recent years (from 1897 onwards) the placer deposits of the Yukon (of which Klondike is a tributary) in Canada and Alaska have also attracted considerable attention, though the 'rush' there has not been of such magnitude, probably owing to the extreme severity of the climate. In Australia the gold 'diggings' of Victoria and South Australia, famous from 1851 onwards, were shallow placers, and were marked by the existence in them of nuggets of considerable weight. Thus, South Australia produced the 'Blanch Barkley' nugget weighing 146 lbs., and Victoria the 'Welcome' nugget weighing 183 lbs., and worth £8,370.

Shallow placers are worked very simply, the material of the deposit, which may be quite on the surface, or so near it as only to require a shallow pit to be sunk to reach it, being washed to remove sand and mud—the gold, on account of its high specific gravity, remaining. Washing may be carried out on the small scale in a simple sheet-iron pan, or, better, in a rocker or cradle. In the latter the material is rocked with water in a riddle, by which stones are removed, the finer material passing on to an inclined board covered with blanketing to catch the smaller gold particles, whilst the coarser gold is caught by transverse ridges or 'riffles' fixed across the bottom, over which the muddy liquid flows on its way out. The 'Long Tom' was a further development, and is a short and simple variety of the sluice-box, by which alluvial gold is now almost entirely treated. Sluice-boxes vary much in design and dimensions, but are in effect long troughs jointed together and slightly inclined, down which the auriferous gravel or sand is washed, the gold and heavy sand being caught by riffles as before—some of the riffles containing mercury, to dissolve and retain the finer particles of gold. The working of the placers on the Yukon is peculiar in that the deposit is

perennially frozen, and can only be excavated after being thawed by large fires—the gold being washed out in summer.

The working of shallow placer deposits requiring simply the washing of the 'pay dirt,' it could be carried out by individuals or small parties with very little capital, thus rendering the conditions obtaining in the Australian and Californian 'rushes' possible. These easily-worked placers are now almost exhausted, and as the deep placers require very considerable capital to attack them, the entire aspect of placer mining has changed. Deep placers may be worked by the ordinary methods of mining, such as by sinking shafts, or running levels through the superincumbent rock till the deposit is reached and brought to the surface to be washed, though, if the deposit is in suitable banks on the sides of gulches, etc., and a water-supply is available, they are treated more simply by 'hydraulic mining.' In this process, which can be worked very economically, water is conveyed by pipes from a considerably higher level, so that it can be thrown in powerful jets against the banks of gravel, which is thus washed down sluices, and the gold collected as before. In the case of deposits in the beds of rivers, the auriferous gravel is collected either by diversion of the stream, or more usually by dredging.

Alluvial deposits are now of less importance than the rock deposits in which gold is also found. These may be divided into four classes as follows: (1) metalliferous veins containing gold along with metallic sulphides, principally iron pyrites; (2) quartz reefs containing gold, principally free, but also in sulphides disseminated in the quartz; (3) the 'banket' reef of the Witwatersrand or 'Rand,' which consists of a conglomerate of quartz pebbles cemented together by silica and iron oxide, the gold being present in a very fine state of division, chiefly in the cement; and (4) silicious deposits containing gold, such as that of the Mount Morgan mine in Queensland. Auriferous quartz and pyritic ores are found in Mysore, in the Urals, the United States, the Transvaal, Australia, and New Zealand in large amounts, occurring to smaller extents in almost every part of the globe.

In working such deposits, the rock containing the gold is in general very hard, and after mining, often at a considerable depth, is first broken by some kind of stone crusher into small pieces. It is then reduced to the finest powder by stamps. A stamp battery generally contains five stamps in one frame working in a single mortar. A stamp con-

sists of a vertical iron rod, to which is attached a large piece of iron shod with a cast-iron or steel shoe, which, falling on the mortar block, crushes the ore. The stem of each stamp is lifted by a cam fixed on a revolving shaft. The mortar is five feet long and four feet high, having at the back a feed-opening, and at the front a fine sieve, which regulates the size of the particles passing through it, the holes varying from one-twenty-fourth to one-fortieth of an inch in diameter. Water is run through, and the gold collected on amalgamated copper plates, which line and are placed in front of the mortar. The material that escapes from the plates contains some gold, and is now 'concentrated' to remove worthless sand, etc., as far as possible. This concentration is carried out by causing the pulp (1) to flow over inclined surfaces covered with blanketing, (2) to pass down a shaking rubber belt called a 'frue vanner,' and (3) to settle in conical wooden vessels, all with the object of separating the fine heavy particles containing the gold. The concentrates, if non-pyritic, are treated in grinding pans in the bottom of which mercury is placed. The amalgam, after squeezing out the excess of mercury, is heated in an iron retort, to distil off the rest and leave the gold.

Whilst simple stamping and amalgamation with mercury do fairly well for weathered and 'free-milling' ores containing free gold in a suitable form for solution in mercury, those ores of a more refractory character, and containing gold along with sulphides, require chemical treatment to obtain the gold from the finely-powdered and concentrated ore.

Chlorination Process.—The first process introduced for treating concentrates containing sulphides, and recovering the gold that escapes amalgamation, is still employed to a certain extent, and depends on the conversion of the gold into a soluble chloride by the action of chlorine.

Sulphide ores must be first roasted in a reverberatory or mechanical furnace to remove the sulphur and convert base metals into oxides. Sometimes a second roasting with common salt is resorted to, with the object of converting the gold into chloride, which as the temperature rises is decomposed, leaving gold in a finely-divided metallic state. The material is then placed in large vats or revolving barrels, moistened with water, and treated with chlorine gas to form a solution of gold chloride. This is then run off, and the gold pre-

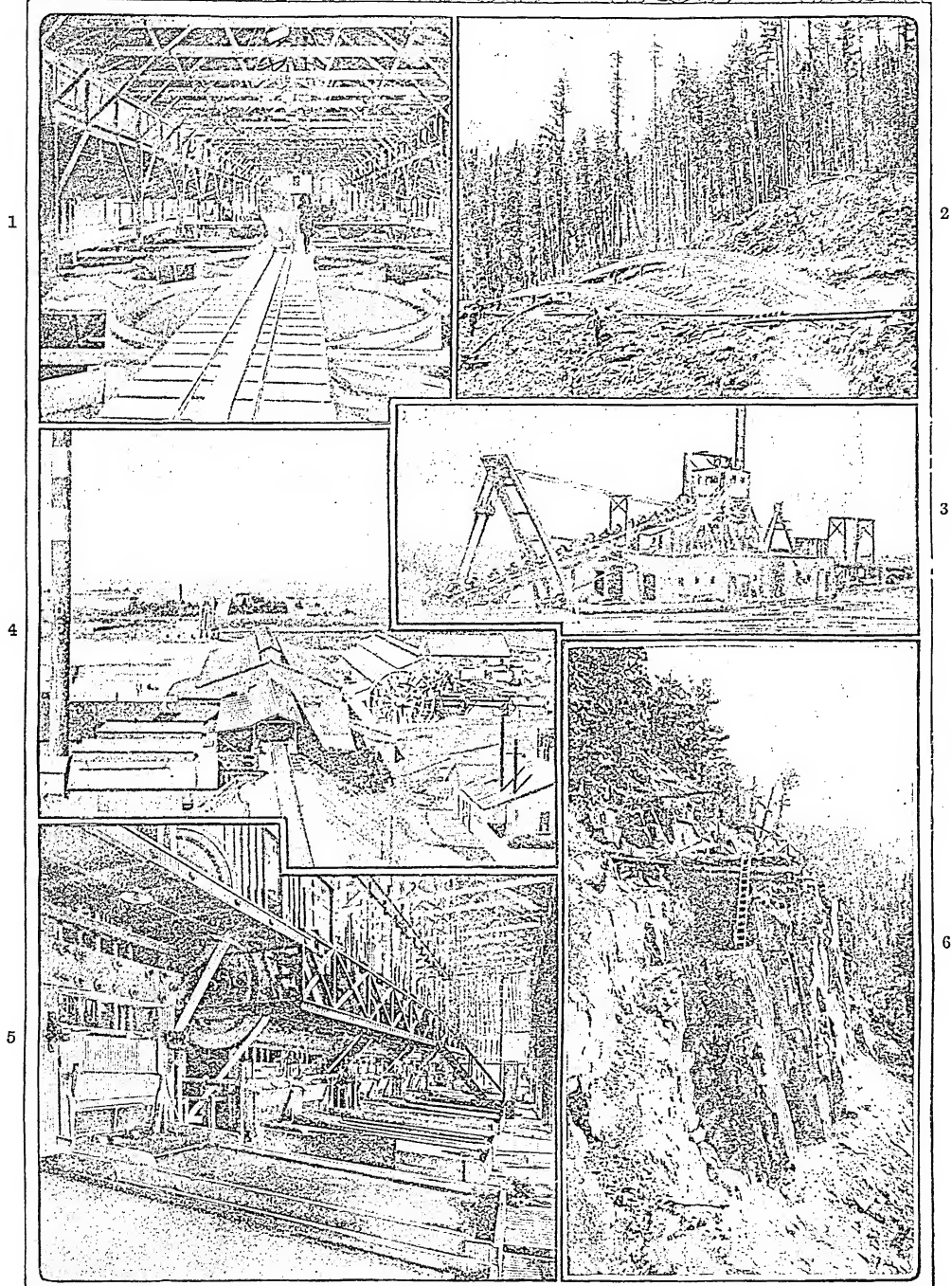
cipitated, usually by means of ferrous sulphate.

Cyanide Process.—In 1891 the cyanide process, invented by MacArthur and Forrest, was introduced on the Rand, and has now almost entirely superseded other methods of recovering finely-divided gold. In it the finely-crushed ores, concentrates, or slimes are leached in vats with a very dilute solution of potassium cyanide, containing '05 to '3 per cent. of potassium cyanide, or its equivalent in sodium cyanide, which is allowed to remain for twelve to twenty-four hours to dissolve the gold. The cyanide solution is then run off, and the gold precipitated by clean zinc shavings or by electrolysis, about 1½ grains of gold being left in each ton of solution and lost.

Besides the sources of gold mentioned above, gold telluride is found in Australia and America, whilst sea-water is believed to contain about one grain of gold to the ton.

Refining and Parting.—Impure gold is melted in crucibles, and the impurities, if small in amount, fluxed off with sodium carbonate and a little nitre. If much base metal is present, the gold is refined by nitre and borax, added a little at a time, and the slag skimmed off at intervals. Miller introduced the method of refining by means of chlorine gas, which forms volatile chlorides with base metals, and liquid chloride with silver, leaving the gold free. The 'parting' of silver from gold is now generally effected by boiling the alloy, which should contain about five times as much silver as gold, with concentrated sulphuric acid. The gold is left, and the silver recovered by crystallizing the sulphate and reducing it by carbon.

Gold has a yellow colour when in mass, but in a finely-divided state it may be purple, ruby, or black. It is very heavy (sp. gr. 19·3), the most malleable and ductile of metals, and also one of the softest. These last properties render possible the preparation of gold leaf. Gold melts at 1,064° C., and is volatile at very high temperatures, such as that of the electric arc. It has a specific heat of '0316, is a good conductor of heat and electricity, and is quite unaffected by air and most reagents. Gold forms two classes of compound, the aurous and the auric. Of these, auric chloride (AuCl₃), a red salt obtained when gold is dissolved in aqua regia, unites with hydrogen chloride to form a yellow salt (HAuCl₄), used in photography for toning the silver image. Gold is mainly employed as a pecuniary standard, being alloyed with two parts in twenty-four of copper



Gold Mining and Extraction.

1. Cyanide gold extraction, Johannesburg. 2. Hydraulic gold-mining at Murray, Idaho. 3. Gold dredger at work, California. 4. New Primrose gold mine, Johannesburg. 5. Gold-crushing mill, Johannesburg. 6. Entrance to a gold mine, California. (Nos. 1, 2, 4, and 5 from photos by N. P. Edwards.)



or silver to harden it against the wear and tear of circulation. Gold alloys are also largely employed for jewellery, the gold content of these alloys being expressed in 'carats,' or parts of pure gold in twenty-four. Thus '18-carat' gold is composed of 18 parts of pure gold alloyed with 6 parts of copper and silver in such proportions as are required to produce the desired colour. See Rose's *Metallurgy of Gold* (1898), Bissler's *Metallurgy of Gold* (1900), and *The Cyanide Process for the Extraction of Gold* (1898).

Whereas in 1893 the total output of gold for the whole world was £32,379,000, of which £14,810,000 was in the British empire, in 1903 the total was £68,135,000, of which £38,788,000 was in the British empire. The mines in the Transvaal from 1889 to 1898 produced about 69 million pounds in value, or 18.7 per cent. of the total gold output of the world. The Transvaal output for 1903 was £12,590,000; 1904, £16,021,000; 1905, £20,802,000.

Goldap, tn., prov. of East Prussia, 33 m. by rail S.E. of Insterburg. Manufactures linen and woollen goods. Pop. (1900) 8,349.

Goldau, hamlet, Swiss canton of Schwyz, lying between the lakes of Zug and Lowerz. It is the starting-point of one of the cog-wheel railways up the Rigi. In 1806 it was destroyed by a landslip from the Rossberg.

Gold-beating. See **GOLD LEAF**.

Goldberg, tn., prov. of Silesia, Prussia, 13 m. by rail S.W. of Liegnitz, with woollen and other industries. Pop. (1900) 6,518.

Gold Coast, British colony on the W. coast of Africa, stretches about 350 m. along the coast of the Gulf of Guinea, between the French colony of the Ivory Coast and the German colony of Togoland. Inland it extends to about 11° N. lat., and comprises the former kingdom of Ashanti (definitely annexed in 1901), and what are known as the Northern Territories. The soil is fertile, especially near the coast. Forests exist in the west, and gold is plentiful in the districts of Wasau and Tarkwa, also in the west. Palm oil is the principal export; next come rubber and palm kernels, and then lumber, cocoa, kola nuts, and gold dust. The climate is hot and unhealthy, and the rainfall heavy. Exports in 1905 were valued at £1,646,145, and imports at £1,486,069. Of this, £1,044,658 represents imports from the United Kingdom. Education is spreading, there being 143 elementary schools, with an attendance of 10,379 children in 1905. There are technical schools

of a simple character at Accra and Cape Coast Castle; also nine hospitals, one lunatic asylum, but no poorhouses. A railway 180 m. long connects Sekondi with Kumasi. Area, about 40,000 sq. m., exclusive of Ashanti and the Northern Territories, which together have another 80,000 sq. m., and a pop. of 318,000. Pop. (1901) 1,486,433. Chief tn. Accra. Although the English first settled in this region in 1640, British power was not definitely consolidated on the Gold Coast till 1870-72. Ashanti, however, remained unsubdued, and military expeditions against it became necessary. The first of these was in 1874, and the second in 1895, when Kumasi was taken and King Prempeh captured and deported. In 1900 over 40,000 Kumasis, Adansis, and Kokofus rebelled, and besieged Kumasi, which, however, was soon relieved, and the rebellion was stamped out.

Golden Age, an epoch of primitive innocence and prosperity; hence the best age of any country's history, literature, or art. Thus the golden age of Italy was in the early 16th century, or 'Cinquecento'; that of France the period of Louis XIV., and that of England the reign of Elizabeth.

Golden Bull, a document drawn up by the Emperor Charles IV. in 1356 to settle matters connected with the imperial election. It remained a fundamental law until the close of the Holy Roman empire in 1806. By it the number of the electors was fixed at seven, the election of the future emperor was to take place at Frankfurt-on-Main, and the elected prince was to be crowned at Aachen (Aix-la-Chapelle), and to hold his first Diet at Nuremberg.



Golden-crested Wren.

Golden-crested Wren (*Regulus cristatus*) is the smallest of European birds. It does not belong to the same family as the true wren, but is one of the warblers (Sylviidae). The length of the body is from three to six inches; there is a bright yellow crest; the back is yellowish olive green, the wings and tail ash brown with black and white markings. The golden-crested wren is generally distributed over Europe, and is a breeding species in Britain.

Golden-eye (*Clangula glaucion*), a duck which visits Britain, but does not apparently breed there. In the drake the head is glossy green, with a slight crest and white cheek patches; the upper parts of the body are mostly black and the under white. The golden-eye extends across Europe, Asia, and N. America. An allied species, *C. islandica*, is abundant in Iceland and North America.

Golden-eye Fly, or **LACEWING FLY** (*Chrysopa vulgaris*), an insect belonging to the Neuroptera, remarkable for the golden sheen of the eyes and the delicate greenish colour of the body. The gauzy wings are green or pink according as the light falls upon them. The larva feeds on aphides. The eggs are laid on leaves and are stalked. The golden-eye is related to the ant-lion, and is widely distributed.

Golden Fleece. See **JASON**.

Golden Gate, the strait, 5 m. long and from 1 to 2 m. wide, leading from the Pacific to San Francisco Bay, California, U.S.A.

Golden Horde. See **KIPCHACKS**.

Golden Horn. See **CONSTANTINOPLE**.

Golden Legend, a collection of lives of the saints, composed by Jacobus de Voragine (1230-98), a Dominican, and eventually archbishop of Genoa. It contains many well-known medieval tales, and was very popular. English version by Caxton (1483); best critical edition by Grasse (1846).

Golden Number. See **CALENDAR**.

Golden Rod, or **SOLIDAGO**, a genus of hardy herbaceous plants belonging to the order Compositae. They are mostly natives of N. America, and are of the easiest culture. Their flower-heads are small, and usually arranged in racemes. There is one British species, fairly common in shady places on dry ground. This is the yellow-flowered, autumn-flowering *S. virgaurea*.

Golden Rose (*Rosa aurea*), an ornament of wrought gold, solemnly blessed by the Pope on the fourth Sunday in Lent, and sent as a mark of special favour to some sovereign, church, or community. The custom dates back at least to Gregory the Great. Urban V. first made the ceremony annual about 1366.

Gold-eye. See **MOON-EYE**.
Goldfinch (*Carduelis elegans*), a pretty little bird which occurs throughout England. It is a favourite cage-bird, both on account of its bright plumage and its power of song. In the wild state it feeds on the seeds of thistles and other weeds.

Gold-fish (*Carassius auratus*), a member of the carp family which occurs abundantly in the wild state in China and parts of Japan. The wild form is of a brownish colour, but the domesticated race has the familiar red-gold tint. Gold-fish have been kept in confinement in Japan for a prolonged period, and many remarkable varieties and monstrosities have been produced by selective breeding. They are stated to have been introduced into England in 1691, and are often kept in artificial ponds. If the temperature of the water be sufficiently high they will breed freely. See CARP.

Goldie, SIR GEORGE DASHWOOD TAUBMAN (1846), was born in the Isle of Man. Devoting



Golden Rod (*Solidago virgaurea*).
1, Ray floret; 2, disc floret.

himself to African travel, he went to the Niger (1877), and two years later formed a company for uniting British interests in Nigeria, the company ultimately becoming (1886) the Royal Niger Company. He took part in an expedition against Mohammedan tribes in Nupe and Ilorin (1897). In 1900 the territories of the company were taken over by the British government. In May 1905 Sir George Goldie succeeded Sir Clement Markham as president of the Royal Geographical Society; he also served on the War Stores Commission of that year.

Goldingen, tn. in gov. Courland, Russia, 40 m. from the Baltic Sea; has manufactures of

woollen goods, needles, etc. Pop. (1897) 9,733.

Gold Lace, properly speaking, does not signify actual lace, but braid or cord made of gold-covered silken threads, which on naval and military uniforms serves to indicate rank and different branches of the service. The cheapest variety is made of silk coated with a mucilaginous substance, and wound tightly round rollers, gold leaf being applied to the surface. The usual and most satisfactory method of covering the silk is by 'fibre plating,' a process which originated in India. In this a bar of silver, or silver and copper alloy, is coated with leaves of burnished gold, and drawn out into wire by means of a steel drawplate. The wire is sometimes so fine that a mile weighs only one ounce; finer threads can be produced by using perforated rubies or diamonds. The wire is flattened, annealed, and wound by a spinning-machine round yellow or orange silk. Actual lace is made of gold thread on a pillow, and resembles torchon.

Gold Leaf, one of the forms in which gold is applied for the purpose of gilding, is prepared by a prolonged beating out of the metal between sheets of vellum and thick skin. A preliminary fusion at a high temperature serves to increase the malleability of the gold; after which it is cast into ingots, and rolled between powerful smooth steel rollers to a ribbon about ten feet long and one and a half inches wide. After annealing, this is cut into pieces weighing about six and a half grains, which are then ready for the beating-out process. First the pile of alternate paper, gold, and vellum is beaten for about twenty minutes with a hammer weighing some eighteen or nineteen pounds. The gold leaves are then removed, cut into four pieces with a steel knife, and alternated with the skins of the 'shoder.' These latter are prepared from the outer coating of the 'cæcum' or blind-gut of cattle. In the shoder some two hours' beating with a ten-pound hammer is requisite; after which the leaves are again cut into four pieces and placed in the 'mould,' in which only the finest skins are used. After about four hours' treatment with a seven-pound hammer, the leaves, which are about $\frac{1}{252000}$ of an inch in thickness, are trimmed upon a leathern cushion, and placed in books holding twenty-five. The leaves are about three and a quarter inches square, and are produced in ten different shades of colour, according as the gold was alloyed with much or little copper or silver.

Goldmark, KARL (1830), Austrian musical composer, born at Keszthely, on the Plattensee, son of a poor Jew, was brought forward by Hellmesberger, director of the Conservatorium at Vienna. *The Queen of Sheba* (*Die Königin von Saba*), a work teeming with gorgeous Oriental colour, first bespoke his greatness. This was produced at the Court Opera in Vienna in 1875. But Goldmark will perhaps be best remembered by his so-called symphony, *The Country Wedding* (*Ländliche Hochzeit*), a piece of descriptive orchestration played all over Europe. The libretto of a short opera, *The Cricket on the Hearth* (1893), is a free rendering of Dickens's story. Among other works by him is *Merlin* (1886) and *Die Kriegergefangene* (1899).

Gold of Pleasure, a name given to *Camelina sativa*, a plant belonging to the order Crucifere.

Goldoni, CARLO (1707-93), writer of Italian comedy, born at Venice. His first tragedy, *Amalasunta*, failed, but he achieved success with *Belisario* (1734). He ultimately found his true vocation in comedy. His *Momolo Courtisan* was followed by many others, of which *La Notte Critica*, *La Bancarotta*, *La Donna di Garbo*, *L'Impostore*, *Locandiera*, *Le Baruffe Chiozzotte*, *I Rusteghi*, *Il Ventaglio*, *Il Bugiardo*, *Il Caffè*, *La Pamela*, and *Dama Prudente* are among the best. His autobiography (*Mémoires*) appeared in 1787, a collected edition of his works in 1788-9, and a selection in English entitled *The Comedies of Goldoni* in 1892. See *Lives* by Molmenti (1879), Galanti (2nd ed. 1883), and (in French) Rabany (1896).

Golds, primitive people belonging linguistically to the Tungusic group, and inhabiting the banks of the Lower Amur and the Ussuri, S.E. Siberia. They are mainly fishers and hunters, but some display great skill in silk embroidery. They are Shamanists.

Goldsboro, city, N. Carolina, U.S.A., co. seat of Wayne co., 50 m. S.E. of Raleigh; the centre of an agricultural and cotton-growing region. Pop. (1900) 5,877.

Goldschmidt, MADAME. See LIND, JENNY.

Goldschmidt, MEYER AARON (1819-87), Danish publicist and author, born at Vordingborg, of Jewish extraction, first became famous and feared as editor of the Copenhagen comic paper *Corsaren* (1840-6). His first romance, *En Jøde* (1845; Eng. trans., *The Jew of Denmark*, 1852), was followed by *Fortællinger* (1846). The magazine *Nord og Syd* (1847-59), edited and written entirely by himself, became renowned for masterly treatment of social and political topics, and

in it he began the romance *Hjemløs* (1853-7; Eng. trans., *Homeless*, 1861). From 1862-87 he produced romances and collections of tales, which stamp him as a deep and delicate psychologist and a perfect master of style—*Arvingen* (1863); *Ravnens* (1867); *Rabbi'en og Ridderen* (1869); *Fortællinger og Virkelighedsbilleder* (1877-83); *Smaa Fortællinger* (1869). See his own *Livs-Erindringer* (1877).

Gold-sinny, or **CORK-WING** (*Grenilabrus melops*), a fish of the wrasse family, common off British coasts. It does not exceed seven inches in length, and is remarkable for its beautiful though fleeting colours. In life the general colour is green with a golden sheen, but the tints fade at death into a dull gray or brown.

Goldsmith, OLIVER (1728-74), British author, born at Pallas, Co. Longford, Ireland. He became private tutor in a good family, but deserted the situation. Sent to Edinburgh (1752) as a medical student, he lived there a wild, shiftless life, thence proceeding to Leyden; he lost his last shilling at play, and started on foot for 'the grand tour,' equipped with one clean shirt! He seems to have mainly relied for support upon his flute. Making his way to London (1756), he was in turn a strolling player, an actor, a bookseller's hack, a chemist's assistant, and at last depended on writing for Griffiths's *Monthly Review*. Becoming known to Johnson, he formed one of the lexicographer's circle. The events of his life are mainly summed up in the issue of his books—his poem, *The Traveller* (1764); *The Vicar of Wakefield* (1766); his comedy, *The Good-Natured Man* (1768); his *Roman History* (1769); and his great poem, *The Deserted Village*, in 1770. These were followed by his *English History* (1771), and his excellent comedy, *She Stoops to Conquer* (1773), the plot of which turns upon an incident of his boyhood. His *History of Animated Nature* was posthumously published in an incomplete form. His humorous poems, *The Hunch of Venison* and *Retaliation*, also appeared after his death. His quaint incongruities extended to his dress. Like Savage, when he was in funds he walked in slovenly splendour. Like Gay, he was 'in wit a man, in simplicity a child,' generous also, and with a faith in human nature which, though often abused, was never shaken. *The Traveller*, the *Vicar of Wakefield*, and many of his Essays, contained his own life's experiences. In his pages were revived the easy grace and simplicity of the *Spectator*, and men welcomed again the gentle irony of Addison

and the kindly heart of Steele. His complete works were published in 12 vols. in 1900. See *Percy Memoir* (1801); biographies by Walter Scott (new ed. 1862), Macaulay (new ed. 1901), Prior (1837), Washington Irving (1850), W. Black (Eng. Men of Letters, 1878), Mitford (new ed. 1866), Austin Dobson (1888). The most complete is that by Forster (6th ed. 1877).

Goldsmiths are mentioned as one of the adulterine crafts in London about 1212, and the history of their progress and development is in the main that of the gild in general. The goldsmiths emerged from the obscurity of a livery company into economic importance about 1645. At that time they began to receive money on deposit, and even to allow interest on it. These depositors early learned to draw bills on their bankers—the goldsmiths—and in this way the notion of a paper currency became familiar. Parliament even agreed to accept goldsmiths' bills in payment for the confiscated bishops' lands. But after the revolution they found themselves unable to meet the competition of the newly-established Bank of England. See Jackson's *English Goldsmiths and their Marks* (1905).

Goldsmiths' and Jewellers' Work. From Egypt, Assyria, Greece, Etruria, Rome, and Cyprus, from Mexico and Peru, specimens of goldsmiths' work have been recovered, and these enable us to appreciate the abundant skill, alike in design and in craftsmanship, displayed by the early workers in the precious metals. In the Egyptian sarcophagi, necklaces, rings, hair ornaments, bracelets, and chains are numerous, some dating from about 2000 B.C., all beautifully fashioned, and sometimes set with stones or pieces of glass resembling enamels. Early Greek specimens are largely composed of gold work only, stones and enamel being rarely used; bracelets, wreaths of beaten sheet gold, necklaces, pendants, rings, pins, and hair ornaments are chiefly met with; most of these are formed of thin gold, upon which are delicate designs in extremely fine wire or minute grains of gold firmly soldered to the plate. Wreaths of ivy, vine, or myrtle, in which the leaves are of thin gold stamped to the shape of the leaf or berries, and then fixed to a connecting band, are often found. In Etruria much work of great beauty has been discovered, similar in style to the Greek; the use of grain ornaments, due to Phœnician and Greek influence, is carried to a perfection which no modern efforts have excelled. Very characteristic work comes

from India, though European influences are deteriorating the traditional forms and methods of working. Delicate ornaments of filigree are fashioned of fine wire into lace-like open work, and richly set with stones and enamels; the workers pursue their art in the open air with few and simple tools.

The jewel of King Alfred, now in Oxford, is an example of Anglo-Saxon work. Early Irish work was of a high standard in both design and execution; it consists of richly-interlaced forms of birds and grotesque animals, combined with stones and enamels. The Tara brooch, the shrine of the bell of St. Patrick, and the cross of Cong are typical Celtic work. Albert Dürer served his apprenticeship as a goldsmith in Germany; and in Florence and other Italian cities the most highly esteemed of the crafts was that of the goldsmiths, and these artists trained most of the great painters and sculptors of the 15th and 16th centuries. Brunelleschi, Donatello, Ghiberti, and many others received their first training in art in the goldsmith's shop. Benvenuto Cellini has preserved vivid pictures of his life and work as a goldsmith and sculptor of the renaissance. In his treatise he sets forth the contemporary practice of sculpture, metal, and goldsmiths' work. The renaissance jewellery is very largely of cast work; a model was first made in wax, from which a mould was taken, and into this the molten gold was poured. Ornaments were afterwards enamelled and set with precious stones; ships, figures, and birds were favourite subjects for pendants. The Darnley jewel in England is a well-known example of this style.

After the 16th century the goldsmiths' art declined, and the workers no longer ranked as the leading craftsmen of their time. Many stones were massed together, the gold work serving only to secure the stones in their places, and no attempt was made to obtain harmony of arrangement or beauty of design. During recent years great advance has been made in jewellers' work, and beautiful designs combined with excellent craftsmanship are often to be seen.

In its pure form gold is too soft, and is therefore alloyed for the purposes of the craft. (See **GOLD**.) By varying the alloy differently coloured gold is obtained. Green gold shows the presence of silver; copper makes red gold. The manufacture is carried on chiefly in London, Paris, Birmingham, Vienna, and Berlin. In London, Clerkenwell is the

home of the goldsmith and jeweller, and much of the finest work of British manufacture for many years has been produced there. Large factories exist, but there are many small workshops in which the different branches are carried on. In the modern manufacture of goldsmiths' work, machinery is employed, especially in the less expensive classes of work; but in the higher branches the work is to a large extent carried on by hand. Diamond mounting and setting, chain and ring making, engraving, chasing, enamelling, gilding, and polishing are sometimes carried on in the same factory, but often as separate industries. See J. Hungerford Pollen's *Gold and Silver Smiths' Work* (1878); Benvenuto Cellini's *Life* (trans. by J. A. Symonds, 1896); Benvenuto Cellini's *Treatise* (trans. by C. R. Ashbee, 1898); Theophilus's *Arts of the Middle Ages* (trans. by Thomas Hendrick); T. B. Wigley's *The Art of the Goldsmith and Jeweller* (1898); and Henry Wilson's *Silverwork and Jewellery* (1903). For hallmarks, see SILVERSMITHS' WORK.

Goldsmiths' Company. See LONDON LIVERY COMPANIES.

Gold Stick. The office of gold stick dates back to the reign of William IV. It is held by the colonel of each of the three regiments of household cavalry in rotation for one month at a time. The gold stick in waiting receives from the King personally the parole and the countersign, and reports direct to the King as well as to the Army Council. He also lays before the King all orders issued by the Army Council.

Goldstücker, THEOPHILUS (1821-72), German Sanskrit scholar, was born at Königsberg; went to Paris, where in 1842 he edited a German translation of the *Prabodha Chandrodaya* (1842). Accepting the professorship of Sanskrit at University College, London (1851), he held the appointment until his death. Among his works is a valuable monograph on Pāṇini and his *Place in Sanskrit Literature* (1861). He was the founder of the Sanskrit Text Society (1866). His *Literary Remains* were published in 1879.

Gold-thread, a name given to the threadlike roots of a North American herb, *Coptis trifolia*, belonging to the order Ranunculaceae. Sometimes the name gold-thread is applied to the bitter tonic which is prepared from the roots, and sometimes to the yellow dye prepared from them.

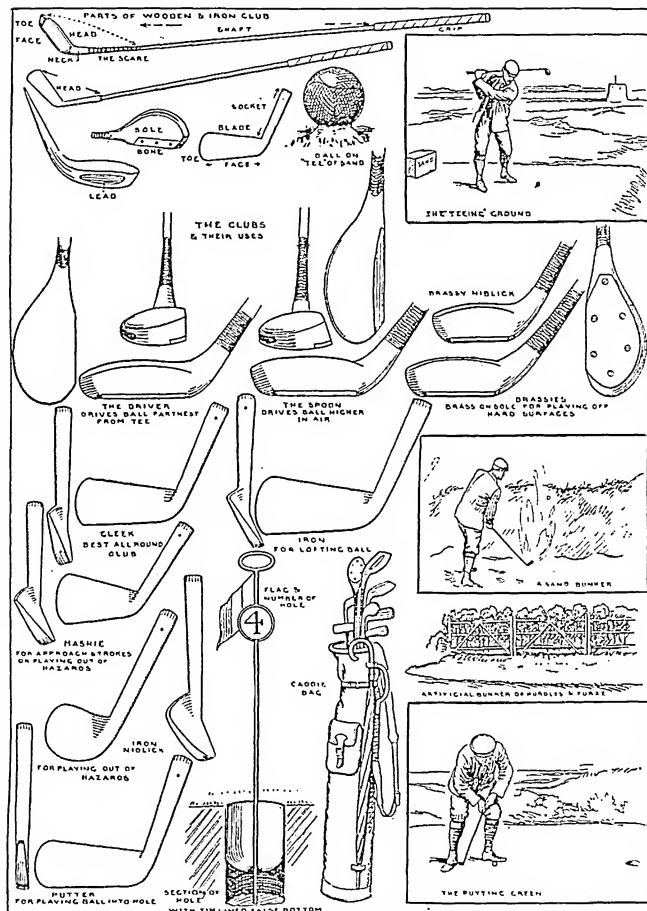
Goldy Locks, a name given to plants belonging to the genus *Chrysocoma*, a subdivision of the order Compositae; characterized

by an imbricated involucre, a simple, hairy pappus, and a naked receptacle. There is one rare British species, *C. Linosyris*.

Goletta (Fr. *La Goulette*), port of Tunis, N. Africa; connected with Tunis by a ship canal (1893) about 7 m. long and 21½ ft. deep.

Golf, of course, among most of its devotees, has the credit of being a Scottish game, but there are certain evidences that the

games in which a player strikes a ball at rest, and strives to hit it to a particular place. And he is allowed to hit it without interference from his opponent, who has another ball, which he endeavours to play into the same goal in fewer strokes than the other. The goal into which they try to play is a small hole in the ground, of the statutory size of four and a quarter inches in



Golf: the Apparatus and Details of the Game.

Scots may have had it from Holland. Wherever the first home of the game may have been, it is certain that any existence it now has in Holland is only as a consequence of recent reintroduction; that Scotland kept the traditions and practice of the game alive; that she gave it to all the Anglo-Saxon peoples, which is as much as to say that it is played all over the world.

Golf belongs to the class of

diameter, and the instruments which they use for this purpose are many and diverse. It is probably true that they all are developments of the crooked stick, the curved end being used to hit the ball, but it is nevertheless noticeable that the Dutch pictures generally show us people playing with an iron-headed club. Possibly that may have been because they so often played on the ice, which would be apt to break

wooden-headed clubs, especially when the frost had made them brittle.

The game begins by one of the parties hitting off from a marked line—called the teeing-ground—towards the first hole. As a rule, on a full-sized course, the holes are eighteen in number, and vary in their distance apart from one hundred to five hundred yards, roughly speaking. Beside each of the putting-greens—as the smoothly-kept ground near the holes is called—is one of these marked teeing-grounds. The parties—except under certain conditions, and subject to certain penalties too detailed to enter into—are not allowed to touch the ball with the hand after it has been struck from the tee until it has been played into the next hole, after which they may take it out of the hole and 'tee' it upon the teeing-ground, in a fair position for the drive-off to the next hole.



*Earliest known Figure of a Golfer: face missing.
(Eastern window, Gloucester Cathedral.)*

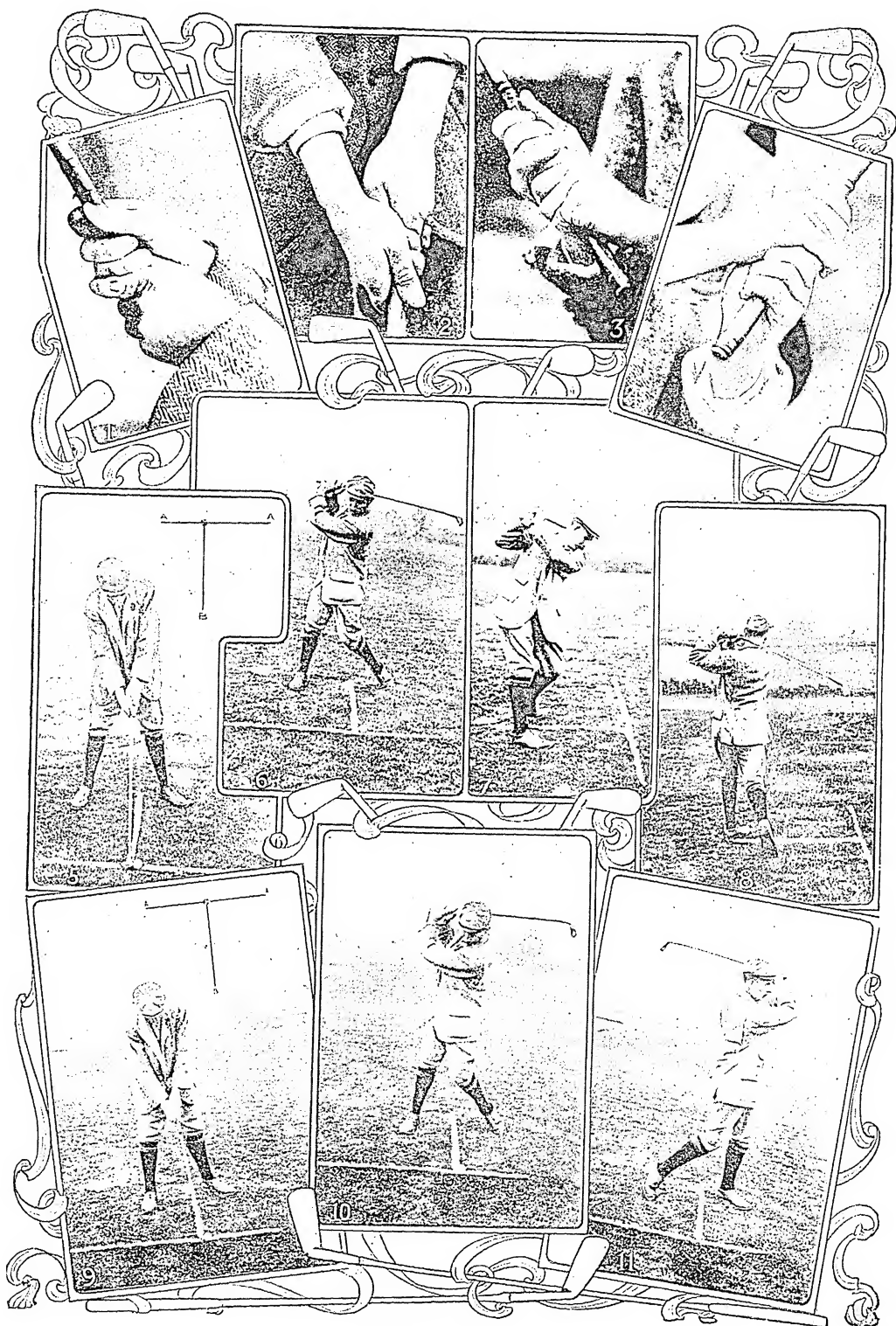
Seeing that some of the holes are as much as five hundred yards from the tee, and that the ground is by preference much broken up in places, undulating and diversified, it is evident the ball will lie in a variety of different kinds of ground—in long grass, in casual holes, in sand-pits (technically called bunkers), and so on; and also that the distances it is required to send the ball will differ a great deal in the different strokes. It is to meet these different exigencies that the different clubs—as the weapons are called with which the player strikes the ball—have been devised. The names of the chief of these are as follows: driver, brassie, spoon, cleek, iron, mashie, niblick, and putter. The first three are wooden-headed clubs, the last five always have iron heads, except the putter, which is sometimes of iron and sometimes of wood in the material of the head. The clubs, as above named, are ranged in the order of length of driving, the driver being the one that is used for

striking to the greatest distance, when the ball is on the 'tee'—i.e. a little mound of sand on which it is placed at the commencement of each hole, to give greater facility for striking it fairly. The putter is the club used only for the short strokes round about the hole, on the 'putting-green,' which is ground kept clear of 'hazards'—that is to say, of difficult places—on a radius of something like twenty yards around the hole itself. There is a gradation in the length of shaft of the clubs from driver down to putter, corresponding with the different lengths of stroke for which they are respectively designed, and there is a corresponding difference in the amount of spring or elasticity in the shafts, the shaft of the driver being the most springy and supple, and that of the putter and the niblick the most stiff and rigid. The niblick is especially designed for taking the ball out of very bad 'lies,' such as heavy grass and holes in sand.

The average distance that a good driver will send the ball from the tee, including the run, is something like two hundred yards, when the ball is well hit. If the hole be a long one, so as to require a second stroke of equal length to this, he may take his driver again, if the ball be lying on a good and smooth piece of turf. It is more likely, however, that the lie will not be sufficiently good for this club; in that case he will take the brassie, or the spoon, each of which has the face that meets the ball rather more laid back than in the case of the driver, so that they lift the ball more readily off the ground. These clubs, we may roughly say, will, in capable hands, drive a hundred and seventy-five yards. Should the ball lie somewhat more badly than we have now supposed—should it, for instance, have found its way into one of the sand-pits or bunkers with which good golf-links are liberally furnished—the cleek, iron, or niblick will become necessary, and these are named in the order in which they will best cope with successive degrees of bad lies. The cleek may be used in a moderately bad lie, and it may be said roughly that a cleek shot has a measure of some one hundred and fifty yards, the iron somewhat less, and the niblick considerably less again. But as the niblick has the most loft, or greatest inclination, on the face that meets the ball, so it will loft the ball most quickly, and is therefore *par excellence* the club for taking the ball out of evil places. But this gradation of loft, or angle of face, and also of length of shaft—as noticed

above—has the merit of enabling the player to get the distances that he requires, in order to reach the hole and not to go beyond it, by merely changing his club, and making very little alteration in the force with which he strikes the ball. But besides the full swing, as it is called, which is used with the driver, or with any club when it is required to drive the greatest distance to which it is capable of sending the ball, there are many modifications of stroke, called respectively the three-quarter, the half, and the quarter swing, or wrist stroke, which we have named in inverse order of the different lengths to which they will send the ball. Among the most crucial strokes of the game, are those that are called the 'approach' strokes, from the fact that their object is not so much to get any great distance on the ball's flight, but to lay it as near as possible to the hole. The two things that surprise the person who is not acquainted with the game, on first seeing it played, are the length that the ball can be driven with the full strokes, and the frequency with which the seemingly very easy strokes, such as hitting the ball into the hole from the distance of a yard, say, are missed by the very best players. Some idea of the number of strokes required, and of the difficulty of the game, may be conveyed by mentioning that an ordinary course of eighteen holes is very fairly well done by a first-class player, supposing the day to be calm, in a score of an average of four and a half strokes to each hole.

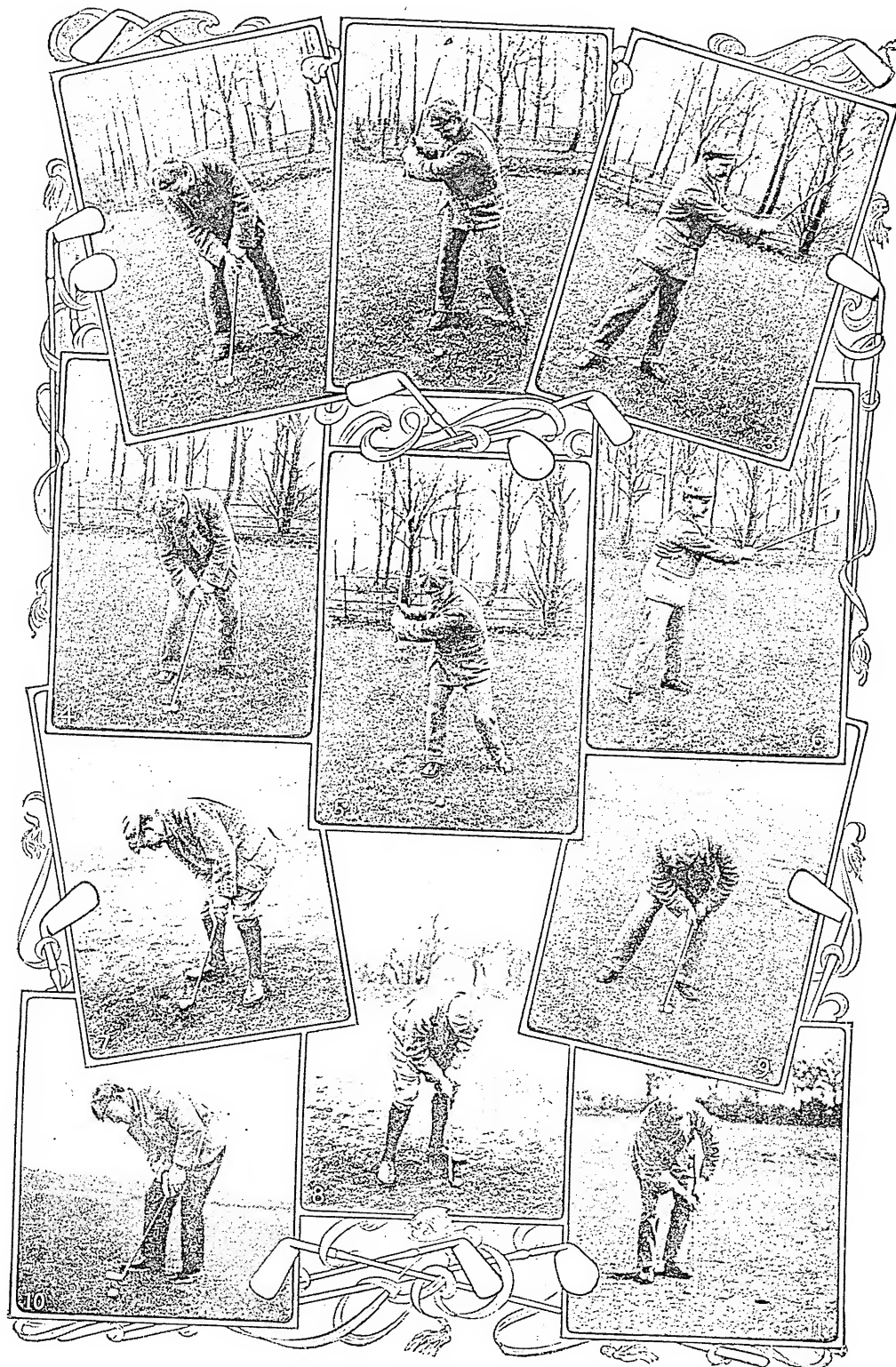
The kind of ground that is considered most favourable for golf is that which in Scotland is called links. It is of a sandy nature, the soil covered with a fine, close-growing turf, and diversified with sandhills, sand-pits, or bunkers, or gorse, and other rough ground that serves to test the skill of the golfer both in avoiding them and in playing the ball out of them when, in spite of his efforts, it has found its way into them. This ground is almost, if not quite, formed by alluvial deposit—that is to say, by the gradual filling up of the flatly-extended embouchment of a river into the sea. For instance, all the links on which the championships of the game are played—viz. St. Andrews, Prestwick, and Muirfield in Scotland, and Hoylake (near Liverpool) and Sandwich in England—are of this character. There are very many others which there is no space to speak of here. The inland greens, as they are called, though some of them happen to be quite close to the sea, are of a different and



Positions In Golf.—I.

1. Taylor's grip. 2, 3, 4. Vardon's overlapping grip. 5, 6, 7, 8. Stance and swing for driver and brassie (Vardon). 9, 10, 11. Stance and swing for cleek (Vardon). (Fig. 1, photo by Stuart.)

(By permission, from Taylor's 'On Golf,' and Vardon's 'Complete Golfer'.)



Positions in Golf.—II.

1, 2, 3. Address and swing for mashie (Taylor). 4, 5, 6. Iron shot, pitch and run (Taylor). 7, 8. Vardon putting. 9, 10. Taylor putting. 11. Lofting a stinzie (Taylor). (Figs. 1 to 6 and 9 from photos by Stuart, Figs. 10 and 11 by G. W. Beldam.)
 (By permission, from Taylor's 'On Golf,' and Vardon's 'Complete Golfer'.)



more clayey kind of soil, and are less favourable for playing the game, on account of the mud that forms on them after a little rain, of the frequency of the casts thrown up by worms, and the hard-baked condition into which they get in summer and in time of drought.

Golf was played in Scotland for very many generations before it became at all a favourite game in England. We know that it was played as far back as the fifteenth century, and how long before that is unknown. It was not till after the middle of the nineteenth century that it began to make any headway in England, although, curious to say, the golf club at Blackheath has older records than are possessed by any Scottish club. This club was formed when James I. (of England) lived at Greenwich, and his Scottish courtiers amused themselves with their native game on the common. If it is too much to say that this was the date of the club's formation, it at least owes its subsequent origin to this introduction of the game. But it was not until golf was started at Westward Ho in North Devon, between 1850 and 1860, that the game began to get any hold south of the Tweed. Since that time its popularity has increased at a tremendous rate, and the popularity which it has achieved in England, the land of its adoption, has reacted in its favour in the land of its virtual origin, so that in the summer season the links of St. Andrews, North Berwick, and indeed every seaside links in the United Kingdom, are thronged with players all the day. Ireland has many very excellent courses, of the right sandy quality, as good as any in the world. Incidentally, the curious fact may be noticed, that with the exception of the golf club at Blackheath, the oldest in the world out of Scotland is the club at Calcutta, where a few enthusiastic Scots started the game (1829) before it was thought of in England, except at Blackheath. And after the Calcutta club, in point of seniority among clubs south of the Tweed, comes the club at Pau in the south of France, which likewise owed its origin to the enthusiasm of voluntarily exiled golfers. It is impossible to name a part of the globe where the Anglo-Saxon has made his residence that has not its golf course. In America the game has lately 'boomed,' with an enthusiasm almost beyond anything known elsewhere, especially since Travis, an American, won the British amateur championship.

The ordinary way of scoring the game may be understood

from the two following quotations from the Rules of Golf: 'The game consists in each side playing a ball from a teeing-ground into a hole in successive strokes, and the hole is won by the side which holes its ball in fewer strokes than the opposite side, except as otherwise provided by the rules. If the sides hole out in the same number of strokes, the hole is halved.' And again: 'A match is won by the side which is leading by a number of holes greater than the number of holes remaining to be played. If each side win the same number of holes, the match is halved.' For example, if A has won six holes, and B four, and seven holes have been halved, A—supposing the round to be of the ordinary length of eighteen holes—will be two holes up, with only one hole remaining to be played, and has therefore won the match. The remaining hole or holes, after the decision of the match, are called the 'bye.' This is the ordinary way of playing the game in a match, each player playing his own ball. Sometimes two on each side play alternate strokes with the same ball; the match is then called a 'foursome.' In the former case it is called a 'single.' But there is also another way of playing that is adopted for competitions in which it is required to test the relative merits of a great number of players at the same time, and that is by 'score' play, as it is called, in contradistinction to 'match' play. In the 'score' play the total score of each player for the whole of the eighteen holes, or whatever may be the length of the course over which the competition is to take place, is added up, and he who has the lowest total is the winner. Most clubs have several 'medal' meetings, as they are called, in the course of each year, and the competitions for these medals are generally held under these conditions of 'score' play.

There are two principal championships, exclusive of the ladies' championship—the 'open' championship, which is open to all the world, and the 'amateur' championship, that is, of course, restricted to amateur players. The first of these is decided by 'score' play, over seventy-two holes, occupying three days in the decision; and the second is by tournament match play, each defeated player being knocked out, and his victor going on into the next round, until there is only one survivor, the champion. These championships are played in succession on the two English and three Scottish greens named above. The ladies' championship is played by tournament match play, like

the amateur championship, but is not restricted to a recognized succession of greens as its arena. Among other competitions are the Irish Open, the Scottish Ladies', and the Irish Ladies' Championships.

The professional players, no doubt because of constant practice, and also because the game is their source of livelihood, have always one or two among their number who are just a little better than the best of the amateurs; but the balance is very slight in their favour, and is liable to be upset. The weight of their advantage is fairly indicated by the result of the 'open' championship, which has only thrice been won by an amateur player—twice by Mr. H. H. Hilton, and once by Mr. J. Ball, jun. It generally happens, however, that an amateur is amongst the first three or four in this open championship.

The favourite material for the heads, that is to say for the striking part of the clubs, is beech in the case of the wooden-headed clubs, but sometimes dogwood or persimmon is used. The shafts, which are whipped to the heads with pitched twine, are nearly always of hickory, with leather or india-rubber round them for the grip of the hands. The heads are weighted with lead at the back, and are strengthened with horn on the bottom to prevent the wood from being worn away by friction on the ground. Until recently the balls were made of gutta-percha, or of some composition into which gutta-percha largely entered; but lately the Americans have invented an india-rubber filling, formed by winding strong india-rubber over a hard core, and casing the whole with gutta-percha. This gives a superior elasticity, and enables the ball to be driven slightly farther, relatively to gutta-percha balls, with the iron-headed clubs. These rubber-filled balls have practically superseded gutta-percha balls.

The Royal and Ancient Golf Club of St. Andrews (founded 1754) stands, in the golfing world, in something like the position occupied by the Marylebone Cricket Club in the world of cricket. For a good many years the rules that it promulgated for playing the game on St. Andrews links were accepted by practically all golf clubs, subject to a few local by-laws rendered necessary by the peculiar local circumstances of each. But within the last few years, a standing committee, called the Rules of Golf Committee, has been appointed to consider questions arising on the rules, and to recommend any necessary alterations; but, inasmuch as this committee consists exclusively of members of the Royal and Ancient

Club, and as its decisions are subject to confirmation or rejection by the general meeting of the club, it cannot be said that the club has really abrogated anything of its tacitly acknowledged status as the lawgiver of the game. In the United States the central authority is the United States Golf Association, which was formed in 1894.

The greatest professional match of recent years was that in 1905 between J. H. Taylor and H. Vardon, representing England, and J. Braid and A. Herd, Scotland. The match was played at St. Andrews, Troon, Lytham and St. Anne's, and Deal, and was won by the Englishmen by 13 holes up and 12 to play.

See Simpson's *Art of Golf* (1892); Park's *Game of Golf* (1896); Hutchinson's *British Golf Links* (1897), *Golfing* (5th ed. 1898), *Book of Golf and Golfers* (1899), *Aspects of Golf* (1900), and *Golf* (Badminton Library, 7th ed. 1902); Clark's *A Royal and Ancient Game* (new ed. 1899); Low's *Concerning Golf* (1903); *Book of Golf*, by Braid, Hutchinson, etc. (1903); Travis's *Practical Golf* (1904); Duncan's *Golfing Annual*, *Golfers' Handbook and Year Book*, and Low's *Golfers' Year Book* (1905-6); Vardon's *The Complete Golfer* (1905).

Golgotha, the scene of Christ's crucifixion, is a knoll on the N. of Jerusalem, just outside the Damascus Gate. It has a precipitous southern face, in which is the cave known to Christians as 'Jeremiah's Grotto.' A Jewish tradition identifies this with the place of execution mentioned in the Talmud (Mishnah Sanhedrin, vi. 1) as early as the 2nd century A.D.

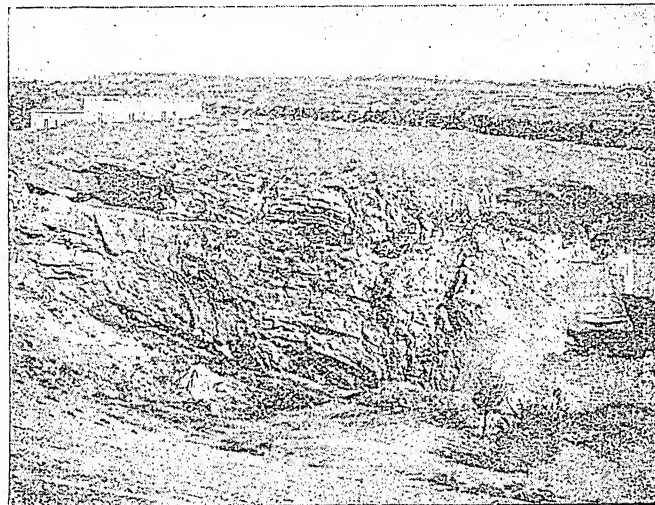
Goliath, a celebrated Philistine giant, born in Gath, who challenged the army of Israel, and was encountered and slain by David. His height was 'six cubits and a span,' or a little over eleven feet. See 1 Sam. xvii.

Goliath, a British first-class battleship (12,950 tons) launched at Chatham in 1898. Since 1781 there have been ships of this name.

Goliath Beetle, a lamellicorn beetle belonging to the chafer family (Scarabæidae), found in W. Africa, and remarkable for its large size. The largest known species is *Goliathus giganteus*, which reaches a length of 3½ in., and is velvety-black in colour, with white markings.

Gollancz, ISRAEL (1864), English man of letters, born in London; was lecturer at Cambridge (1888-96), lecturer in English at University College, London (1892-95), professor of English language and literature, King's College, London (1903). He was appointed first secretary of the British Academy on its formation

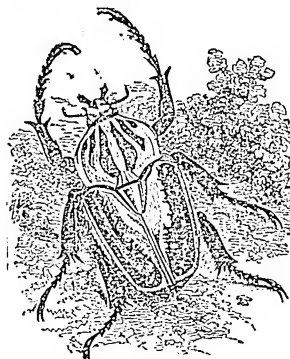
in 1902. His edition of *Pearl*, an old English poem (1891), was followed in 1892 by *Cynewulf's Christ*. Since then he has published *The Exeter Book of Anglo-Saxon Poetry* (1895); the *Temple Shakespeare* (1894-6); *The Parliament of the Three Ages* (Roxburghe Club, 1897); *Hamlet in Iceland* (1898); and in 1903 edited *The Love-Letters of Dorothy Osborne to Sir W. Temple*.



Golgotha and Jeremiah's Grotto.

Göllnitz, or GOLLNITZBANYA, mining tn., Hungary, co. Szepes, 32 m. by rail N.W. of Kaschau; mines iron and copper, and has iron works. Pop. (1900) 4,087.

Gollnow, tn., prov. of Pomerania, Prussia, 20 m. by rail N.E. of Stettin. Has copper works and woollen and paper mills. Pop. (1900) 8,539.



Goliath Beetle.

Golomynka. See OIL-FISH.
Goloshes, a term formerly applied in England to wooden clogs. The black vulcanized rub-

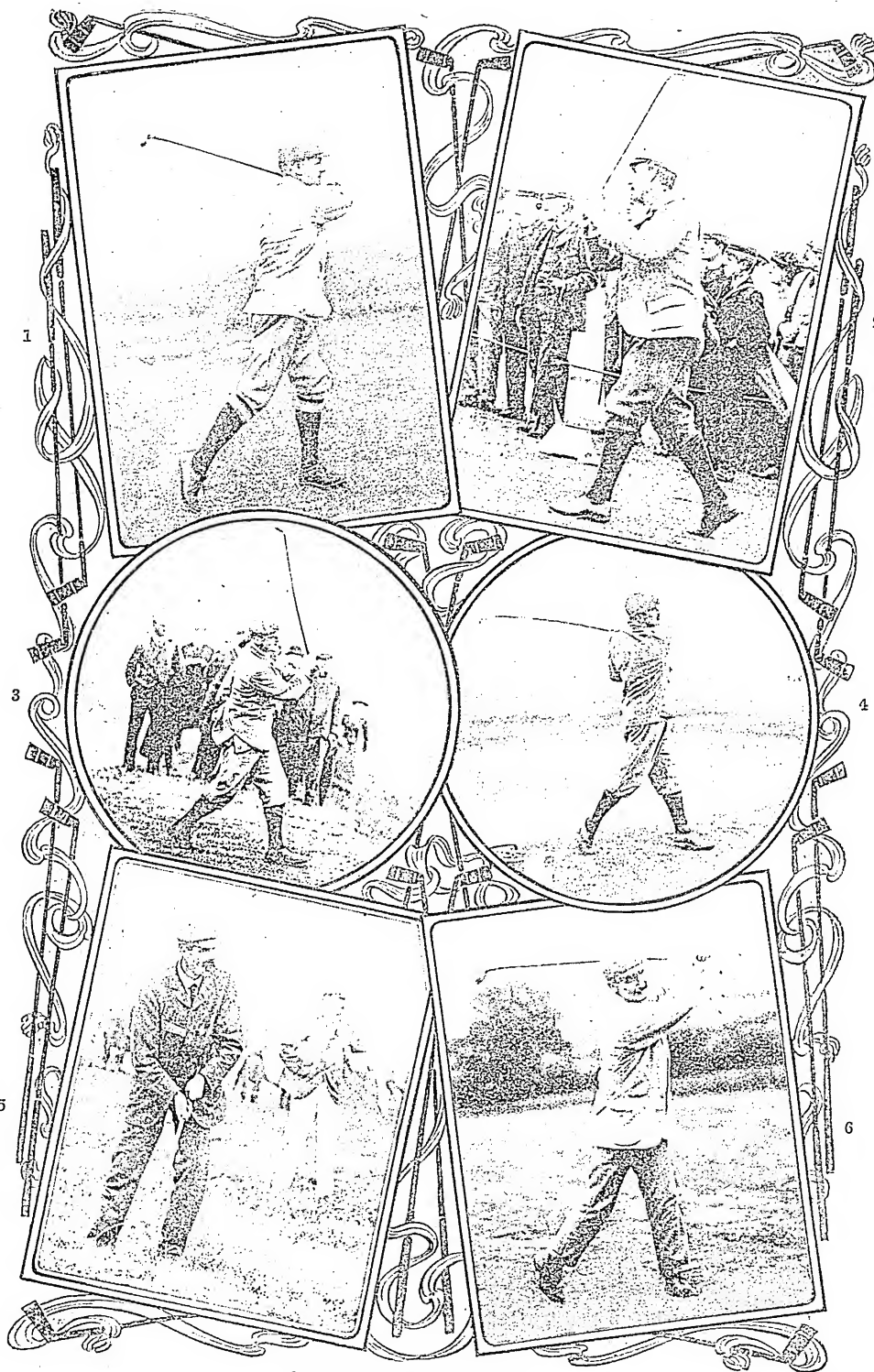
ber overshoes at present bearing the name are American inventions, and were first introduced into England in 1847.

Golovnin, VASILII MIKHAILOVITCH (1776-1831), Russian navigator, born at Gilynki (Ryazan). An expedition to survey the coast of Kamchatka and that of north-western America in 1806 resulted in the capture of Golovnin by the Japanese (1810). He returned to

Russia in 1814, and after writing his *Narrative of my Captivity in Japan* (Eng. trans. 1818; new ed. 1852) he set sail again in 1817 to circumnavigate the globe. The record of his successful voyage was published at St. Petersburg (1822). A collected edition of his works appeared in 1864.

Goluchowski, AGENOR, COUNT (1812-75), Austrian statesman, first gave proof of his abilities by dealing with the disaffection of the Polish nobles in Galicia, during his ten years' (1849-59) governorship of that crown land. He was governor again from 1866 till his death. In 1859 he was appointed to the ministry of the interior, but withdrew in 1861. —His son, AGENOR (1849), was Austrian ambassador at Bucharest (1887-93), and in 1895 succeeded Count Kalnoky as foreign minister.

Gomar, or GOMARUS, FRANCIS (1563-1641), Protestant theologian, born at Bruges; was appointed to the chair of theology at Leyden (1594). After being professor at Saumur (1614-18), Gomar spent his later years in lecturing at Groningen. His works, among them *Lyra Davidis*, were published at Amsterdam in 1645 and 1664.



Snapshots of well-known Golfers.

1. Mr. H. H. Hilton. 2. H. Vardon at Guildford. 3. Mr. E. Blackwell at Sandwich. 4. Mr. R. Maxwell at Sandwich.
5. J. Braid at Deal. (Photo by Bowden Bros.). 6. A. Herd at Guildford.

Gomberville, MARIN LE ROY DE (1600-74), French author, and one of the first members of the French Academy, born in Paris. Chief among his works is *Poléxandre* (1632), a romance of Mexico; others are *La Carithée* (1622) and *La Jeune Alcibiade* (1651), the unfinished sequel to *Poléxandre*. He was a purist in language.

Gombroon. See BENDER ABBAS.

Gomel, or HOMEL, tn., gov. Mohilev, Russia, 125 m. N. of Kiev, with sugar manufacture and boat-building. Pop. (1897) 35,846.

Gomera, one of the Canary Is., about 17 m. W. of Tenerife. Area, nearly 145 sq. m. Cattle-rearing is the principal industry, but silk and potatoes are exported. The chief town is San Sebastian, on the E. coast. Pop. about 15,000.

Gomes de Amorim, FRANCISCO (1827-92), Portuguese poet and novelist, born at Avelomar, near Oporto. He emigrated to Brazil, where he was inspired by Almeida-Garrett's *Camões*, and still more by the sympathetic interest of its author, to devote himself to poetry. Returning to Portugal (1846), he entered eagerly into the revolutionary ideas of the time, receiving, however, a government post (1851). Among his poetical works are *Cantos Matutinos* (reprinted as *Versos*, 1866); *Ephemeros* (1866); *A Flor de Marmore*; *Derradeiros Cantos*; and *A Idéia Velha*. As a dramatist he was most successful with *O Cedro Vermelho*, dealing with Brazilian life; although *Ghigi*, *A Proibição*, and others are worthy of note. His novels, *Os Selvagens* (1875), and its sequel, *O Remorso Vivo* (1876), are also Brazilian in setting. His work *Garret: Memórias Biográficas* (1881) is of great value. His *Collected Works* appeared in 1866-70.

Gomez, MAXIMO (1826), Cuban soldier, born at Guadalajara; joined the Cuban insurgents in 1868. After the rebellion he retired to Jamaica (1878). At the rising of 1895 he was chosen commander-in-chief, and in June 1896 defeated Castillanos at Puerto Principe, and, with Maceo and Garcia, successfully resisted the Spanish forces during 1896-8. He resented American intervention (1898), but, on the cession of Cuba to the United States, accepted the terms offered by the latter. See Carrillo's *In the Saddle with Gomez* (1898).

Gomez de Avellaneda. See AVELLANEDA.

Gomme, GEORGE LAURENCE (1853), English folklorist and statistician, born in London. For several years he edited the *Antiquary*, the *Archæological Review*, and the *Folklore Journal*; was founder, first secretary, and

sometime president of the Folklore Society; and was appointed statistician to the London County Council, of which body he became chief clerk (1900). Among his numerous publications are *Primitive Folk-Moots* (1880); *Folklore Relics of Early English Life* (1883); *Chapbooks and Folklore Tracts* (1885); *The London County Council* (1888); *The Village Community* (1889); *Handbook of Folklore* (1890); *Ethnology in Folklore* (1892); *Lectures on the Principles of Local Government* (1898). Mr. Gomme also edited the *Gentleman's Magazine Library* (1883-99).

Gömör and Kis-Hont, co. of N. Hungary, between the Hernad and the Gran. It is mountainous, mostly covered with forest, and yields iron. In this county are the great caves of Aggtelek and Dobschau (Dobsina). Area, 1,650 sq. m. Pop. (1900) 183,414. Chief tn. Rimaszombat.

Gomorrah. See SODOM AND GOMORRAH.

Gompertz, BENJAMIN (1779-1865), English astronomer, actuary, and mathematician, born in London, of Jewish parentage. Although a member of the Stock Exchange, he devoted himself to science, and wrote *Hints on Porisms* (1830), *Imaginary Quantities* (1817-18), etc. He also prepared a series of tables of mortality for the Royal Society, and as actuary of the Alliance Assurance Company (founded 1824) he became the foremost authority of the day on this subject. He worked out a series of tables of mortality for the Royal Society.

Gomphia, or BUTTON FLOWER, a genus of tropical shrubs belonging to the order Ochnaceæ. A few species are cultivated under glass in Britain. They like a light, peaty soil. They are evergreen shrubs with terminal racemes of bright yellow flowers.

Gomphocarpus, a genus of tropical and subtropical plants belonging to the Asclepiadaceæ. They are easily grown under glass, the herbaceous species in a light but rich loam, the shrubby species in a fibrous, peaty soil.

Gompholobium, a genus of Australian shrubs belonging to the order Leguminosæ. They are not difficult to grow in a coarse, peaty compost, under glass, in Britain. Free drainage is essential.

Gonaïves, seapt. tn. of Haiti, on S. side of the N. peninsula, opposite Port de Paix. Here Desalines issued the declaration of Haitian independence (Jan. 1, 1804). Pop. 13,000.

Gonçalves, ANTONIO DIAS (1823-64), Brazilian poet, born at Caxias, Brazil. He endeavoured to create a national Brazilian school of poetry, though he wrote, of course, in Portuguese. Some of

his poems are severely classical, but he is best known by his lyrics, ballads, and songs of wild life (*Pocsias*, 7th ed. 1891), which are very popular in both Brazil and Portugal. He lost his life by shipwreck on the coast of his native country.

Goncharov, IVAN ALEXANDROVITCH (1813-91), Russian novelist, born at Simbirsk; held posts in the finance department and the postal department successively. His novels—the best of which are *A Common Story* (1847; Eng. trans. 1894), *The Oblomov* (1858), and *The Precipice* (1870)—show him to have been an artist of no mean order, as well as a keen student of Russian character and manners. A collected edition of his works appeared in 1884. See Zabel's *Russische Literaturbilder*: I. Gontscharov (1899).

Goncourt, EDMOND DE (1822-96), and his brother, JULES DE (1830-70), French novelists, the first-named born at Nancy, the second at Paris; made their earliest literary attempts in *Histoire de la Société Française pendant la Révolution* (1854), *La Société Française pendant le Directoire* (1855), and *Histoire de Marie Antoinette* (1858). The following studies, from the pen of Edmond Goncourt alone, are of more importance: *Gavarni, l'Homme et l'Artiste* (1873); *L'Art au XVIII^e Siècle* (1874); *L'Œuvre de Watteau* (1876); and *L'Œuvre de Prudhon* (1877). As novelists the De Goncourts share with their contemporary, Gustave Flaubert, the earliest place in the French realistic school. Powerful though their pictures of contemporary life are, they are darkened by pessimism. The artistic power shown is undoubted, and is remarkable in the perfect unity of its character. Chief among their novels are *Les Hommes de Lettres* (1860; reprinted as *Charles Demailly*, 1869), *Sœur Philomène* (1861), *Renée Mauperin* (1864), *Germinie Lacerteux* (1865), *Manette Salomon* (1867), and *Madame Gervaisais* (1869). After the death of Jules, Edmond published *La Fille Elisa* (1878), *La Faustine* (1882), *Chérie* (1885), *Les Frères Zemganno* (1879), and *Lettres de Jules de Goncourt* (1885); which were followed by *Journal des Goncourt* (1887-92), *L'Art Japonais au XVIII^e Siècle* (1891-6). There exist English translations of nearly all their works. See *Lives* by Delzant (French; 1889), Belloc and Shedlock (English; 1892), and critical study in Bourget's *Nouveaux Essais de Psychologie* (1885).

Gonda, chief tn. in the dist. of same name, United Provinces, India, 69 m. N.E. of Lucknow. Pop. (1901) 15,811. Area of dist. 2,875 sq. m.; pop. (1901) 1,403,195.

Gondal, feudatory state in Kathiawar, Bombay, India; has an area of 1,024 sq. m. Cotton cloth and silver and gold thread are manufactured. Gondal is the capital. Pop. (1901) 19,592.

Gondar, tn., prov. Dembea, Abyssinia, 25 m. N. of Lake Tsana; was at one time the residence of the emperor, but is now in a state of decay. The Abuna has his seat here, and the town is the centre of Abyssinian learning. Cotton cloths, gold and silver work, and artistic saddlery are manufactured. Pop. about 5,000.

Gondelia, a one-species genus of composite plants. *G. Tournefortii* is a handsome, hardy perennial with prickly, thistle-like leaves and large purple flower-heads. It is easily grown in a light soil containing leaf mould.

Gondokoro, or ISMAILIA, vil., E. Sudan, on the r. bk. of the Nile, 9 m. S. of Lado; was formerly a trading station for ivory.

Gondola, a long, narrow, flat-bottomed boat, used on the canals of Venice, the usual length being about thirty or forty feet. The prow and stern curve high above the water, much after the manner of the ships of the ancients. Gondolas are painted black, according to regulations dating from medieval times. In the centre of the boat there is generally a curtained chamber, where the passengers may sit. The gondolier stands in the stern, and propels the boat by means of a long sweep, while another gondolier sometimes stands at the bow.

Gondomar, DIEGO SARMIENTO DE ACUÑA, MARQUIS DE (1567-1626), Spanish statesman and diplomatist. From 1613-23 he acted as ambassador to the English court. He carried on the negotiations for the proposed marriage of Prince Charles with the Infanta Maria. See S. R. Gardiner's *Prince Charles and the Spanish Match* (1869).

Gonds. See DRAVIDIAN.

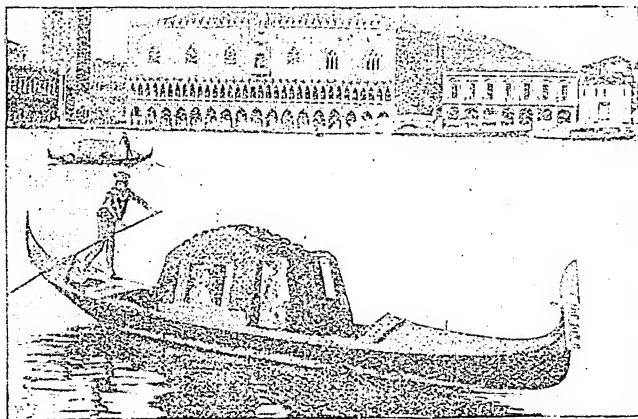
Gonfalon (a later form of *gonfanon*) is not the small pennon attached to the lance of cavalry, as some suppose, but a banner; a flag or streamers suspended from a horizontal bar, and used in religious and civic processions from very early times.

Gong, the disc of beaten metal with rim upturned to the depth of two or three inches, which serves as a bell in warfare and religious celebrations in India, China, and Java. 'Gong metal' consists generally of 78 parts of copper to 22 of tin. The instrument is hung by the rim, and when struck by a leather-covered wooden mallet emits a loud, resonant, and vibrant sound. A Burmese gong is made of polished metal, and is roughly triangular in shape.

Gongora, a genus of evergreen epiphytal orchids with long racemes of pendulous flowers and with long, lanceolate leaves. The cool house affords the right temperature.

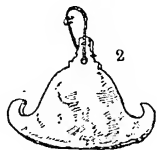
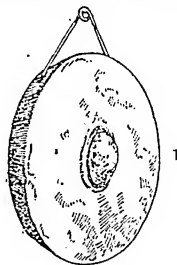
Gongora y Argote, or, more correctly, ARGOTE Y GONGORA, LUIS (1561-1627), Spanish poet, born at Cordova. He was the leader of a new school, in whose writings metaphor, hyperbole, and neologism ran riot, and brought down upon it the scorn of Lope de Vega, Quevedo, and the purists. His early poems, particularly his sonnets, of which

Goniatites are spirally-coiled shells resembling those of nautilus and the extinct ammonites, and belong to a family of tetrabranchiate cephalopods which range in time from the Devonian to the Permian. The shells are usually an inch or so in diameter, flattened, with a wide depression on each side (the umbilicus), and have a siphonal tube like that of the existing nautilus, but placed on the outer side of the interior of the shell. Many species are found in England and America, in the Devonian and the Carboniferous.



Venetian Gondola.

he wrote a great number, are very fine, and comparatively free from extravagance. His heroic and historical poems are also good,



Gongs.

1. Javanese. 2. Burmese.

especially those describing the battle of Lepanto, and the *Ode on the Armada*. An edition of *Todas sus Obras* appeared in 1654. See E. Churton's *Gongora* (1862).

Gonidia are propagative cells occurring in certain thallophytes (i.e. algae, fungi, and lichens) independently of sexual organs, and ultimately separating from their parent. In the simplest case, the whole contents of certain cells of the thallus divide into gonidia; in other cases special parts of the thallus are set apart to produce these.

Gonocalyx, a one-species genus of the order Vacciniaceæ.

G. pulcher is an evergreen from New Grenada, which makes a good conservatory plant, valuable both for its foliage and its long, red and white, bell-like flowers.

Gonolobus, a genus of American shrubs belonging to the order Asclepiadaceæ. They bear greenish or purplish flowers.

Gonorrhœa is a contagious disease caused by a specific micro-organism, the gonococcus, which is present in the affected tissues and in the discharges from them. The urethra and the vagina are the usual seats of the disease, but other mucous membranes, such as those of the conjunctivæ or of the rectum, may become infected. The period of incubation is usually three or four days, but may be from two days to ten. The acute and pain-

ful stage of gonorrhoea lasts from three to six weeks. During this period there are free purulent discharge, pain and difficulty in micturition, and general febrile symptoms. The disease may become chronic, and continue for many months or even years as a gleet, which is a highly contagious and persistent discharge of glairy mucus. Among women especially gleet is apt to give rise to various complications, such as gonorrhoeal rheumatism and chronic inflammation of the reproductive organs. The general treatment is complete rest, simple diet, and abstinence from all stimulants. Treatment of the acute stage should relieve pain and reduce inflammation. The chronic form may be treated by baths, injections, and various drugs, of the aromatic and antiseptic class.

Gonsalvo di Cordova, or **GONZALO HERNANDEZ Y AGUILAR** (1453-1515), Spanish soldier, born at Montilla (Cordova); gained his first military experience in Portugal, at Albuera (1479), and in the war with the Moors of Granada. In command of the expedition to Italy in support of Ferdinand of Naples (1495), Gonsalvo sustained the single defeat of his life, but ultimately drove the French from Naples, and won his title of the 'Great Captain.' Sailing again for Italy in 1500, he became involved in a war with France, in which he inflicted crushing defeats upon the French at Cerignola and at the bridge of Garigliano (1503). After representing Ferdinand at Naples for three years, he was recalled to Spain, and spent his last years in retirement. See accounts by Duponceit (1714) and Florian (1791).

Gonzaga, **tn.**, Italy, prov. Mantua, 17 m. by rail s. of Mantua; gave title to the ducal family of Gonzaga. Pop. (1901) 8,044.

Gonzaga, Italian family who ruled Mantua from the 14th to the 18th century. In 1433 Giovanni Francesco was rewarded by the Emperor Sigismund with the title of marquis, to which Charles v. added that of duke (1530). Other branches ruled over Gabioneta, Castiglione, and Guastalla. One of the family, Luigi (1568-91), renounced his right to the marquisate of Castiglione in favour of his brother Rudolph, joined the Jesuits, and died of the plague contracted through his unremitting devotion to the sick. He was canonized as St. Aloysius. His name-day is June 21. Carlo iv. took the part of France in the war of the Spanish Succession, and on her defeat was placed under the ban by the Emperor Joseph I. Austria took possession of Mantua, and Carlo went into exile, his death rendering the dynasty extinct.

Gonzaga, **THOMAS ANTONIO** (1744-1809), Brazilian poet, generally known as Dirceu, was born at Oporto, Portugal. He went (1768) to Brazil, and was made a judge in the state of Minas Geraes, but was banished (1792) for ten years for implication in a conspiracy to throw off the Portuguese yoke. His poems, *Marilia de Dirceu*, consist of two parts. The first, written before his imprisonment, sings of the charms of his *fiancée*, and of his love for her; while in the second part he laments his sad fate with ever-deepening melancholy. The poems rank among the best love lyrics of Brazil. Best edition by J. da Silva (1845), with biography.

Gonzales, city, Texas, U.S.A., co. seat of Gonzales co., on the Guadalupe, 175 m. w. of Galveston. Pop. (1900) 4,297.

Gonzalez de Avila, **GIL** (1577-1658), Spanish historian, wrote a *History of Philip III.* (1623), whose official historiographer he was. His other works include a *History of Henry III. of Castile* (1638), and a *History of Salamanca* (1606).

Gonzalez Vigil, **FRANCISCO DE PAULA** (1792-1876), Peruvian scholar and statesman, born at Tacna; led the opposition to Bolivar (1826). From 1836 he was director of the National Library at Lima. His chief works are *Defensa de la Autoridad de los Gobiernos y de los Obispos contra la Curia Romana*, in 12 vols. (1848-56), for writing which Gonzalez was excommunicated; and *Los Jesuitas* (4 vols. 1872).

Gooch, **SIR DANIEL** (1816-89), English mechanical engineer, was born at Bedlington, Northumberland, and in 1837 entered the service of the Great Western Ry. In 1864 he left the railway, to devote his energies to the project of an Atlantic cable. Gooch's first attempt failed; but in 1866 he was successful. He was M.P. for Cricklade, Wilts (1865-85). Meanwhile the Great Western had become almost bankrupt; but Gooch, assuming the chairmanship of it (1865), completely restored its prosperity.

Goodall, **FREDERICK** (1822-1904), English artist, son of Edward Goodall (1795-1870), engraver of plates after Turner, was born in London; at fourteen won the silver medal of the Society of Arts and the 'Isis' medal. He first exhibited at the Royal Academy when seventeen. After painting popular scenes of old English life, he was elected A.R.A. (1853) and R.A. (1863). He also turned to historical subjects. *Cranmer at the Traitors' Gate* was engraved by his father (1856). After spending a winter (1857-59) in Egypt he painted chiefly Scriptural or Eastern pictures,

but he also executed many excellent portraits. Among his characteristic pictures may be named *The Village Festival* (1847), *Raising the Maypole* (1851), *Reciting Tasso* (1859), *Rising of the Nile* (1865), *An Arab Improvisatore* (1872), *The Return from Mecca* (1881), *The Flight into Egypt* (1884), *Leading the Flock* (1889), and *The Thames from Windsor Castle* (1890).

Good-conduct Pay, extra pay for good conduct given to soldiers in the British army under the rank of corporal—second corporal or bombardier. One penny *per diem* is given for each good-conduct badge, which is worn on the left sleeve. Two years' service is necessary for the first badge, six years for the second, and twelve for the third. One badge is forfeited for each entry against the holder's name in the regimental books, and for trial by a general or district court-martial all badges are forfeited. They can, however, be regained by subsequent good conduct.

Goodenough, **JAMES GRAHAM** (1830-75), British naval officer, was born at Stoke Hill, Surrey. He served in the Baltic during the war with Russia (1854-6), and afterwards during the hostilities with China, especially at the capture of Canton and at the battle of Fatshan (1857). He was also present at the capture of the Taku forts in 1858. He was killed at the Santa Cruz Is. See C. R. Markham's *Commodore J. G. Goodenough* (1876).

Goodenough Medal, a gold medal awarded annually to the naval sub-lieutenant who passes the best examination in gunnery. It was founded in 1830 in memory of Commodore Goodenough.

Good Friday. The anniversary of Christ's passion and death. It was celebrated at an early date with a rigorous fast and special prayers. In the Roman Catholic ritual for Good Friday the ordinary mass is replaced by a mass with a host consecrated on the previous day, called the mass of the Presanctified. The officiating clergy wear black vestments, the altars are stripped of all linen and ornaments, the lights extinguished, and all the bells and instruments are silenced. See **EASTER**.

Good Hope, a British first-class armoured cruiser of 14,100 tons, launched at Fairfield in 1901.

Good Hope, **CAPE OF**. See **CAPE COLONY**.

Goodia, a genus of Australian shrubs belonging to the order Leguminosae. They are evergreen, bear yellow flowers, and are easy to cultivate in a peaty soil.

Goodrich, **SAMUEL GRISWOLD**, better known under his pen-name of 'Peter Parley' (1793-1860),

American author, born at Ridgefield, Connecticut. He became a publisher in Hartford, and later in Boston, Massachusetts, where he edited the *Token* (1828-32), an annual, in which some of Hawthorne's work appeared. His *Recollections of a Lifetime* appeared in 1856. See *Peter Parley's Annual*.

Goodsir, JOHN (1814-67), Scottish anatomist, was born at Anstruther, Fife. In 1841 he became curator of the museum of the College of Surgeons at Edinburgh, and succeeded Monro as professor of anatomy at Edinburgh (1846). He was the author of *Anatomical and Pathological Observations* (1845), and edited *On the Construction and Use of the Microscope* (1853). See *Anatomical Memoirs of John Goodsir*, by W. Turner (1868).

Good Templars, INDEPENDENT ORDER OF, a temperance organization introduced (1868) into England from the United States, where it was established in 1851. It is founded on masonic principles, with a ritual, passwords, and so forth, and is open to all who are willing to take a lifelong pledge of abstinence from intoxicants, and who believe in Almighty God as the ruler and governor of the world. The Grand Lodge offices are at Birmingham. See S. Couling's *Hist. of Temperance Movement* (1862).

Goodwill, a term generally used to denote the benefit attaching to a business from connection and reputation; and its value is what can be got for the chance of being able to keep that connection and improve it (Lindley, *On Partnership*, 1888-91). The sale of goodwill carries with it the exclusive right of using the name of the old firm, and consequently the right to restrain any one else from so doing, or of using any other name so similar to it as to mislead the public. When the goodwill of a business is sold without further provision, the vendor is entitled to set up a rival business, but he may be restrained from canvassing the customers of the old firm. The same rule applies to the case of a person who has been taken into partnership on the terms that the goodwill of the business shall on the expiration of the partnership belong solely to the other partners. Goodwill cannot be sold apart from the business to which it belongs, and it has been doubted whether goodwill can attach to a profession.

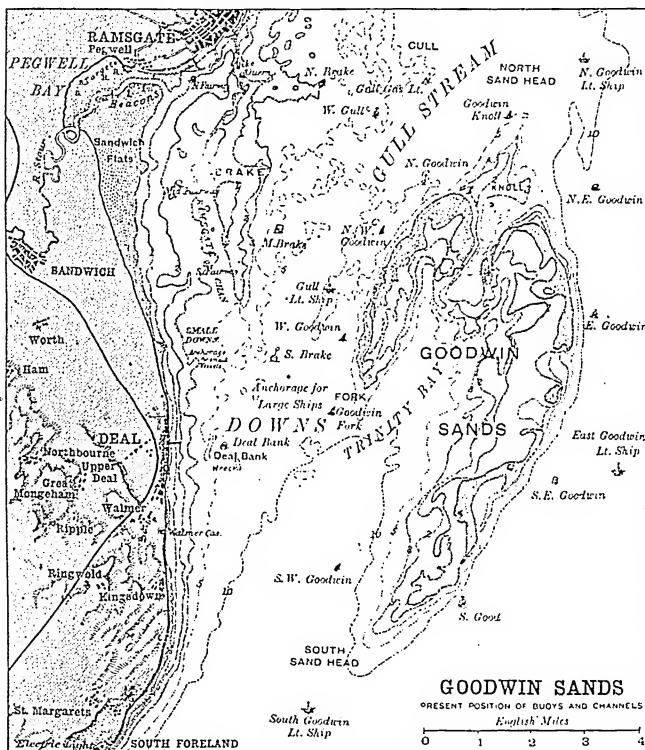
Goodwin, THOMAS (1600-80), English Puritan divine, born at Rollesby, Norfolk. He was in 1643 elected a member of the Westminster Assembly, and identified himself with the Congregational or dissenting party. In

1650 he was appointed, by the Parliament, president of Magdalen College, Oxford, and was one of the trusted friends and advisers of Oliver Cromwell. His works consist mainly of sermons and expositions of parts of Scripture. See *Puritan Divines: Goodwin's Works* (12 vols. 1861).

Goodwin Sands, sandbanks E. of Kent, England, stretching 10 m. N. and S., at a distance of 6 or 7 m. from the coast, Ramsgate and Kingsdown being respectively opposite its N. and S. points. At high water the bank is covered to a depth of 16 ft., but at low

Goodwood, the seat of the Duke of Richmond and Gordon, on the S. Downs, 4 m. N. of Chichester, Sussex, England. The mansion contains collections of art, and relics of Charles I., Napoleon I., and Wellington. The horse-races for the Goodwood Cup have been run here annually since 1825.

Good Words, an English periodical established in 1860 in London. The editorship was undertaken by Norman Macleod, and the publication had from the first 'a serious, solemn purpose,' though its stories and ar-



water a considerable portion is from 3½ to 5½ ft. above the sea, and sufficiently firm for walking on. The Goodwins are known as the scene of innumerable wrecks. Lightships, numerous buoys, fog-signals, and warning guns announce their proximity. They form a natural breakwater, sheltering from easterly gales the wide channel of the Downs. The Goodwins were submerged by a terrible inundation in 1099. See Gattie's *Memorials of the Goodwin Sands* (1890); Treanar's *Heroes of the Goodwin Sands* (1892); Gilmore's *Storm Warriors, or Lifeboat Work on the Goodwin Sands* (1874).

titles were quite an innovation for a religious magazine. Among its literary contributors were, besides the editor, Mr. Gladstone, Sir John Herschel (astronomer), Charles Kingsley, the late Duke of Argyll, Henry Rogers, Principal Tulloch, Dr. Lee, Dr. Caird, Alexander Smith, Mrs. Henry Wood, and Mrs. Craik; while among its illustrators were Mil-lais, Tenniel, Frederick Walker, Holman Hunt, and Charles Keene. Norman Macleod died in 1872, and was succeeded in the editorship by his brother, Dr. Donald Macleod. In 1906 it began to be issued as a penny weekly.

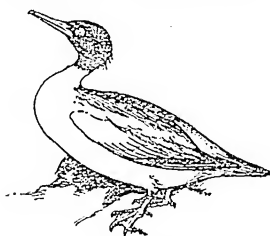
Goodyear, CHARLES (1800-60), American inventor, born at New Haven, Connecticut, who in 1834 instituted experiments on india-rubber with the view of making the natural product suitable for industrial purposes, and to him is due the credit of originating the process of sulphurizing or vulcanizing india-rubber (1844). He is the author of *Gum Elastic and its Varieties* (1853). See Peirce's *Trials of an Inventor* (1867).

Goodyera, a genus of orchids of which one species, *G. repens*, is found in Britain. Numerous tropical species make desirable greenhouse plants.

Googe, BARNABE (1540-94), English scholar and poet, was born at Alvingham, Lincolnshire, and entered the household of Sir W. Cecil. He became noted for his translations, among these being the *Zodyake of Lyfe* (1560) of Marcellus Palingenius, an Italian; followed (1563) by *Eglogs, Epytaphes, and Sonnetes*, a poetical work conceived in a pastoral vein. In 1570 appeared *The Popish Kingdome or Reigne of Antichrist*, a rendering from the Latin of Thomas Naogeorgus. See Arber's edition of his *Epytaphs* (1871).

Goole, mkt. tn. and seapt. in the West Riding of Yorkshire, England, 23 m. s.w. of Hull, at the confluence of the Don and the Ouse. It has extensive docks, and iron foundries, engineering works, and alum works. It rose to importance after the construction of the Knottingley and Goole Canal and two large docks, by the Aire and Calder Canal (1820-6). The fleet of the Goole Steam Shipping Co. was purchased in 1904 by the Lancashire and Yorkshire Railway Co. for the purpose of developing the continental trade. Pop. (1901) 16,576.

Goorkhas. See GHURKAS.



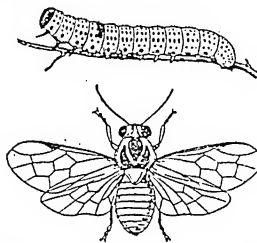
Goosander.

Goosander (*Mergus merganser*), a member of the goose family (Anatidae). It occasionally visits England, but exists as a breeding species in the north-west of Scotland. The bill and feet are red; the male has a greenish-black head, a black back, almost white wings, and is pinkish white beneath.

Goose. The geese are members of the family Anatidae, and cannot be separated from the allied ducks and swans by any hard-and-fast lines of demarcation. In the typical forms belonging to the genus *Anser* the neck is shorter than the body, the beak tapers to its extremity, and bears at its tip a nail-like knob. The two sexes are alike in colour, and the birds, which are typically vegetarian in habit, are more terrestrial than the swans or ducks. The graylag goose (*A. cinereus*) is probably the parent of the domesticated breeds, and as a wild form is the only species which nests in the British Is. Other common species are the brent goose and the bernicle goose. A familiar form in parks is the Egyptian goose (*Chenalopex aegyptiaca*), which was domesticated by the ancient Egyptians. See also POULTRY FARMING.

Gooseberry (*Ribes grossularia*), a deciduous shrub which occurs wild throughout temperate Europe and Western Asia. It has been cultivated in Britain since the 16th century, and is largely grown in France. It thrives in almost any garden soil, but in order to obtain the best results, the soil should be moderately heavy, yet not close, deeply dug, and well enriched with manure. Adult bushes require to be spaced at five or six feet apart, though young bushes may be planted somewhat more closely until they touch. The usual method of propagation is by cuttings, though new sorts have to be raised from seed. The cuttings are best taken in September, and should be about a foot or slightly more in height. Well-ripened shoots should be taken close to the older branches from which they spring. Remove all buds from the lower half, unless it is desired to provide for a number of basal suckers instead of a single stem. The tops also should be carefully cut off. When the cuttings are planted, about four inches should be above ground. The objects to be borne in mind in pruning gooseberries are—to maintain a continuous supply of young, active wood; to allow sunlight to penetrate into the centre of the bush; and to provide space between the branches for the hand to pass in picking the fruit. Old wood should gradually be cut away as young wood takes its place, cross branches should be removed, and side growths should be cut back to one inch from the branches. Mr. Pearson estimates that gooseberries, 4,840 to the acre, will yield for the first three years an average of one quart, or nearly one and a half pounds per bush, making

three tons to an acre; and this at a penny a pound, or £9 a ton, produces £27 an acre. After three years the returns may be more than double; and established, well-grown bushes yield from three to four quarts each, or even more. It is only since about 1890 that the European gooseberries have been successfully cultivated in the United States.



Gooseberry Caterpillar and Fly.

Gooseberry Caterpillar, the larva of *Nematus grossularia*, which is exceedingly destructive to the leaves of gooseberries. The adult insect is a saw-fly, and thus a member of the Hymenoptera. The larva has only one ocellus at the side of the head, and prolegs are present on the fifth body segment. In true lepidopterous caterpillars there are, as a rule, several ocelli at each side, and the fifth body segment never bears prolegs. The body is of a leaden-gray colour, and is covered with rows of black warts, from which hairs spring.

Goose-fish, the name given in America to the angler fish.

Gopher, a term applied in N. America to several small rodents, such as the American representatives of the susliks.

Gopher Wood, mentioned in Gen. 6:14 as having been used in the construction of the ark; has been identified with the cypress, with some kind of cedar, and with a resinous tree (Heb. *kopher* = 'resin'). The word gopher has also been explained as a contraction for, or a corruption of, *goph-rith* = 'pitch.'

Göppingen, tn. and wat.-pl. of Württemberg, 26 m. by rail s.e. of Stuttgart; has cloth, woollens, cottons, machinery, lacquered metal wares, and leather industries, and possesses mineral springs. Pop. (1900) 19,384.

Gorakhpur, chief tn. in dist. of same name, United Provinces, India, on the Rapti, 100 m. n.e. of Benares. It contains a fine 17th-century mosque, and carries on a river trade in grain and timber. Pop. (1901) 64,148. The district, which has an area of 4,578 sq. m., and forms a portion of the great alluvial plain, is watered by numerous rivers, the principal being the Rapti, Gogra,

Great Gandak, and Little Gandak. Chief products: cotton, rice, and other food grains. As Gautama Buddha died within this district, it became the headquarters of Buddhism. It was ceded to Britain by Oudh in 1801.

Gorboduc, or *Ferrex and Porrex*, is the earliest tragedy extant in English. Written by Thomas Sackville and Thomas Norton, it was played before Queen Elizabeth, Jan. 13, 1561, by the gentlemen of the Inner Temple.

Gorchakov. See GORTSCHAKOV.

Gordian Knot. See GORDIUM. **Gordianus**, the name of two Roman emperors. (1.) MARCUS ANTONIUS GORDIANUS AFRICANUS (158-238 A.D.), whilst proconsul of Africa, was raised to the throne in consequence of a revolt against the exactions of the imperial procurator and his master Maximinus. He killed himself in his grief for the loss of his son, after a reign of only two months. (2.) MARCUS ANTONIUS GORDIANUS, grandson of above, was proclaimed emperor in 238, though then not more than fifteen years of age. In 242 he carried on a successful campaign against Sapor (Shapur), king of Persia, driving him out of Mesopotamia, but in 244 was murdered by his general Philip.

Gordium, ancient city, Phrygia, Asia Minor, near the river Sangarius, on the Persian 'Royal Road' to Ancyra. Here Alexander the Great cut the Gordian knot, which fastened the pole to the yoke of the wagon of Gordius, king of Phrygia.

Gordius, the genus to which belong the horsehair-worms or hair-worms of stagnant water. The adults live freely in water, and are four inches or more in length in *Gordius aquaticus*, but as thin as a hair. The eggs are laid in water, but the larvae on emergence bore their way into the bodies of young insects, larvae, etc. If these hosts are swallowed by fish, large carnivorous beetles, etc., the young hair-worms become mature in the second host, whose body they finally quit for the free life in water. The fact that the large water-beetles frequently fly by night from one mass of water to another explains the sporadic appearance of horsehair-worms in rain-water tanks, small ponds, etc. The systematic position of the horsehair-worms is doubtful; they are usually attached as an appendix to the nematodes or roundworms.

Gordon, a noble Scottish family of Norman descent, who settled at Gordon in Berwickshire in the 12th century. Sir Adam de Gordon (d. 1333) joined Bruce (1297), and, in reward of service against the Comyns, obtained from Bruce

the lands of Strathbogie, Aberdeenshire, which he renamed Huntly. He was one of the ambassadors sent in 1320 to Pope John XXII. with the letter asserting Scottish independence; and he was killed at the battle of Halidon Hill (1333). Among the more distinguished of his nearer descendants was the warrior Sir John Gordon, slain at Otterbourne in 1388. Sir John's son, Sir Adam, Lord of Gordon, fell while heading a gallant charge of his clan at Homildon in 1402. His son, Alexander, was in 1449 created Earl of Huntly. Alexander, third earl (d. 1524), established the predominant influence expressed in the phrase 'Cock of the North.' His grandson, George, fourth earl (1514-62), in 1544 suppressed the Highland rising of the Camerons, Macdonalds, and Frasers. He was a prominent supporter of Cardinal Beaton and the Roman Catholics, and after the cardinal's death succeeded him in 1546 as lord high chancellor of Scotland. Having been taken prisoner at Pinkie in 1547, he in the following year obtained his liberty on condition of supporting the policy of England; but he hardly made a pretence of carrying out his pledge. In 1549 he was further granted the earldom of Moray. In 1562 he was defeated, and either was killed, or died from excitement, at the battle of Corrichie. His son, George, fifth earl (d. 1576), was in 1563 sentenced to death for high treason, but was pardoned. After Mary's escape to Dunbar he succeeded Morton as lord high chancellor of Scotland (1566). A brother-in-law of Bothwell, he was deeply involved in the Darnley murder. He joined the conspiracy for Mary's escape from Loch Leven, and continued to support her cause, until he and the Hamiltons came to terms with Morton, which were embodied in the treaty of Perth (1572). His son, George, sixth earl (1562-1636), was in 1599 created marquis. In popular tradition a sinister flavour attaches to his name from the murder, in February 1591-2, of the 'Bonnie Earl of Moray' of the old ballad. His son, George, second marquis (d. 1649), though his sympathies were strongly with Charles I. against the Covenanters, acted so indecisive a part that a reward of £1,000 was put upon his head, and he was ultimately beheaded at Edinburgh (March 22, 1649). His eldest son, Lord George Gordon, one of Montrose's most brilliant officers, was killed at the battle of Alford in 1645. George, fourth marquis (1643-1716), created in 1684 Duke of Gordon, held the castle of Edinburgh in 1682 on behalf of James VII., but capitulated on the

14th June 1689. Lord George (1751-93), a son of the third duke, achieved notoriety by his connection with the 'No Popery' riots of 1780, which led to his imprisonment in Newgate, where he died in 1793. Alexander, fourth duke (1741-1827), was the author of 'There's cauld kail in Aberdeen;' and his first wife, Jane, daughter of Sir William Maxwell of Monreith, celebrated for her beauty and sprightliness, and one of the leaders of fashion in Edinburgh and London, was for some time a friend of Robert Burns. On the death in 1836, without issue, of their son George, fifth duke, who in 1794 raised the celebrated regiment, the Gordon Highlanders, the title Duke of Gordon became extinct, and the marquise of Huntly devolved upon George, fourth earl of Aboyne (1761-1853), descended from James, second son of George, Marquis of Huntly.

The original connecting link between the Gordons (afterwards earls of Aberdeen) and the Huntly branch cannot now be traced. The first of the Aberdeen branch of whom there is historical mention is Patrick Gordon of Methlic, killed at the battle of Arborth in 1445. His descendant, Sir John Gordon, first baronet of Haddo, was beheaded at Edinburgh in 1644 for taking up arms against the Covenanters. The grandson of Sir John, Sir George, third baronet (1637-1720), created Earl of Aberdeen in 1682, was for some time lord high chancellor of Scotland; and George Hamilton (1784-1860), fourth earl, styled by Byron 'the travelled thane, Athenian Aberdeen,' and a distinguished diplomatist and statesman, was prime minister of the coalition government (1852-5) which was responsible for the Crimean war.

The Gordons, earls and dukes of Sutherland, are descended from Adam Gordon of Aboyne, second son of George, second Earl of Huntly, who married Elizabeth, Countess of Sutherland in her own right. See William Gordon's *House of Gordon* (2 vols. 1726-7); 'Gordon Letters' in the *Spalding Club Miscellany*, vol. ii. (1894); 'Gordon Papers,' *ibid.*, vol. iv.; *The Records of Aboyne*, edited by Charles, the eleventh Marquis of Huntly, for the New Spalding Club (1894); *The House of Gordon*, ed. J. M. Bulloch, also for the New Spalding Club, vol. i. (1904).

Gordon, ADAM LINDSAY (1833-70), Australian poet, born at Fayal (Azores); joined the mounted police of S. Australia (1853), his after career embracing many vicissitudes. On the publication of *Sea Spray and Smoke Drift* (1867) he sprang into popular favour, which was heightened by

the issue of *Bush Ballads and Galloping Rhymes* (1870); but in this same year he shot himself at Brighton, near Melbourne, Victoria. Marcus Clark edited his *Collected Works* (1880), and J. H. Ross wrote a memoir, *The Laureate of the Centaurs* (1888).

Gordon, CHARLES GEORGE (1833-85), known as 'Chinese Gordon,' British soldier and administrator, was born at Wool-

wich, Kent; assisted in the assault on the Redan in the Crimea (1855). Taking part in the expedition to China (1860), he was present at the capture of Peking, and, in command of a Chinese force officered by Englishmen and Americans, suppressed the Taiping rebels. In a few months he reorganized his

army, which came to be known as the 'ever victorious,' fought more than thirty battles, and took several walled towns. Sent to Bulgaria (1872) as British commissioner for regulating the Danube navigation, he received an offer from the Khedive to take up the work begun in the Sudan by Sir Samuel Baker. He was appointed (1873) governor of the Egyptian equatorial provinces. In 1880, after failing to

he heroically defended Khartum for several months. Gordon was killed two days before the relieving force came in sight of Khartum. He was a man of profound religious faith. His memory is perpetuated in the Gordon Boys' Homes, and in the Gordon Memorial College (1902) at Khartum. See *Lives* by Hake (1884), Forbes (1884), Gordon (1886), and Butler (1889); also Wilson's *Ever Victorious Army* (1868) and *Last Journals* (1885). His diaries, as well as his letters, have been published.

Gordon, CHARLES W. See O'CONNOR, RALPH.

Gordon, LORD GEORGE (1751-53), leader of the 'No Popery' riots of 1780, was son of the third Duke of Gordon. The riots originated in consequence of the removal of restrictions on Roman Catholics. On June 2, 1780, Lord George assembled a mob at St. George's Fields, London, to accompany him to the House of Commons to present a petition against the recent changes in the penal laws. The mob became violent; the Guards were called out, and dispersed the rioters; but they held London in terror for thirteen days, destroyed chapels, Newgate, the King's Bench, and Lord Mansfield's house and valuable library. Lord George was arrested, sent to the Tower, tried for high treason, but acquitted on the ground of insanity. He afterwards joined the Jewish faith, and died mad, some twelve years later, in Newgate jail. See *Life* by R. Watson (1795); also Dickens's *Barnaby Rudge* (1841).

Gordon, SIR JAMES ALEXANDER (1782-1869), British admiral, born at Wardhouse, Aberdeenshire; was present in the action off L'Orient (1795), and at the battles of Cape St. Vincent and the Nile (1798). In 1811 he was in command of the *Active* in Hoste's action off Lissa in the Adriatic, and at the capture of the *Pomone*. In 1814 he captured Alexandria, Virginia. He became admiral in 1854, and in 1868 an admiral of the fleet.

Gordon, SIR JOHN WATSON. See WATSON-GORDON.

Gordon, LUCIE (1821-69), English authoress and translator, born in London, daughter of the jurist John Austin. She married in 1840 Sir Alexander C. Duff Gordon, Bart. Her German scholarship is seen in translations from Niebuhr, Leopold von Ranke, and others. Her brightly descriptive *Letters from the Cape* (1862) were written while on a health tour. In 1862 she went to Egypt seeking health, and wrote *Letters from Egypt* (1863-5) and *Last Letters from Egypt* (1875).



General Gordon ('Chinese Gordon').

(Photo by Chalkley Gould & Co.)

arrange a treaty between Egypt and Abyssinia, he resigned the governorship of the Sudan. Shortly afterwards he was for a few months secretary to Lord Ripon, governor-general of India. Early in 1884 he was sent by the British government once more to the Sudan, where the Moslem population had broken out in rebellion under the Mahdi; and

he heroically defended Khartum for several months. Gordon was killed two days before the relieving force came in sight of Khartum. He was a man of profound religious faith. His memory is perpetuated in the Gordon Boys' Homes, and in the Gordon Memorial College (1902) at Khartum. See *Lives* by Hake (1884), Forbes (1884), Gordon (1886), and Butler (1889); also Wilson's *Ever Victorious Army* (1868) and *Last Journals* (1885). His diaries, as well as his letters, have been published.

Gordon, PATRICK (1635-99), military adventurer of the 17th century, was born at Auchleuchries in Aberdeenshire; took service with Charles X. of Sweden, and fought against the Poles. In the course of ten years he changed sides seven times, and after fighting for the Poles against the Russians, he finally accepted employment under the Czar. He ingratiated himself with his new master, and was sent on a mission to England (1665) to Charles II. He returned to Russia in time to defeat the Turks. During the absence of Peter the Great from Russia in 1697, Gordon suppressed the revolt of the Strelitzes or household troops.

Gordon Bennett, mt. (15,000 ft.), Central Africa, in the Ruwenzori range, near the Albert Nyanza.

Gordon-Bennett Cup. See BENNETT and MOTOR CARS.

Gordon-Cumming. See CUMMING.

Gordonia, a genus of trees belonging to the order Ternstroemiaceae. The trees are evergreen, and bear beautiful flowers, usually white or cream-coloured.

Gordonia, dist. in Cape Colony along the N. bank of the Orange R. Much of it is covered with sand-dunes, and is dry and arid. The chief centre is Upington.

Gore, CATHERINE GRACE FRANCES (1799-1861), English novelist, born at East Retford in Nottinghamshire. Her first novel, *Theresa Marchmont*, appeared in 1824. Her books, though at times tedious, have nevertheless interested a wide circle of readers who delighted in tales of high social life and its amenities. Notable novels were *Cecil*, or *the Adventures of a Coxcomb* (1841), and *The Banker's Wife* (1843). She also wrote the comedy *The School for Coquettes* (1831), and was a popular song-writer.

Gore, CHARLES (1853), English theologian, became vice-principal of Cuddesdon College (1880), and librarian of the Pusey Library, Oxford (1884). In 1893 he was appointed vicar of Radley, and in 1894 canon of Westminster. After having been chaplain-in-ordinary to the Queen (1900-1) and to the King (1901), he was appointed in 1902 bishop of Worcester, and in 1904 bishop of Birmingham. Dr. Gore was editor (1890) of *Lux Mundi*, in which he wrote the article on 'The Holy Spirit and Inspiration.' Among his numerous publications are *Leo the Great* (1880); *The Incarnation* (Bampton Lectures for 1891); *Expositions of the Sermon on the Mount* (1896) and *The Epistle to the Ephesians* (1898); *Good Citizenship* (1899);

The Body of Christ (1901); *Spiritual Efficiency* (1904); *Catholic Claims* (1905).

Gore, GEORGE (1826), British physicist, born at Blackfriars, Bristol. He is the author of *The Art of Scientific Discovery* (1878), *The Electrolytic Separation and Refining of Metals* (1890), *The Art of Electro-Metallurgy* (5th ed. 1891), as well as other works.

Gorée, tn., French colony of Senegal, W. Africa; stands on a small island a little E. of Dakar, which has now superseded it as the port of the colony. Gorée was a British possession from 1758 to 1763, and from 1800 to 1815. Pop. about 2,000.

Gorey. (1.) Village, Jersey, Channel Is., 3½ m. E.N.E. of St. Heliers. Mont Orgueil Castle is a fine example of a Norman fortress, in which William Prynne and other Puritan leaders were incarcerated. (2.) Market tn., Wexford, Ireland, 59 m. S. of Dublin. Coachbuilding is carried on.

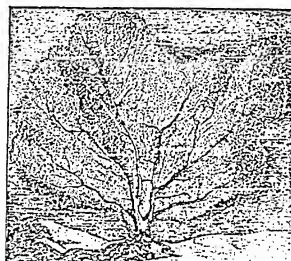
Görgei, ARTHUR (1818), Hungarian general, born at Toporez, co. Zips, in Hungary. On the outbreak of the war with Austria (1848) he embraced the cause of Hungary. Made commander-in-chief in 1849, he achieved brilliant successes against Windischgrätz and Wollgemuth, but was finally compelled to surrender (1849) to the Russians at Vilagos. For this step he was severely censured by Kossuth, who described it as 'treason'; and he was for a time imprisoned at Klagenfurt, but was amnestied in 1867. An abortive effort to restore him to public favour was made in 1885. He published *Mein Leben und Werke 1848 und 1849* (1851; Eng. trans. 1852). See T. Duka's *Kossuth and Görgei* (1898).

Gorges, SIR FERDINANDO (? 1566-1647), American colonist, born at Ashton, Somersetshire. He served in Normandy (1591), and was for a number of years 'governor of the forts and islands of Plymouth.' He took part in the events associated with the downfall of the Earl of Essex. Later (1606-35) he became the founder of two companies instituted at Plymouth with the object of colonizing in New England, America. Under royal authority he became the chartered proprietor of Maine (1639), which after his death passed to Massachusetts.

Gorgias, of Leontini in Sicily, Greek sophist, was born c. 480 B.C. and is said to have lived over a hundred years. He is especially famous as a rhetorician, and was one of the leaders in the formation of prose style. In 427 he came to Athens, and persuaded the Athenians to ally with the Leon-tines. He appears as the leading character in Plato's dialogue called by his name.

Gorgones, the Gorgons. Homer mentions only one, a frightful creature dwelling in Hades; but Hesiod speaks of three—Stheno, Euryale, and Medusa—dwelling in the western ocean, though later legends placed them in Libya. They are described as encircled with snakes, winged, and with brazen claws and huge teeth. Medusa, the only mortal sister, was at first a beautiful maiden; but Athena changed her hair into serpents, and her aspect became so fearful that all who beheld her were turned into stone. Finally Perseus cut off her head, and Athena set it in her shield.

Gorgonidae, or SEA-FANS, are a family of corals, belonging to the Alcyonarian division—i.e. to those in which the tentacles are eight in number. The skeleton is horny and fan-shaped or bushy, but a certain amount of lime is always present. Examples are *Gorgonia verucosa*, common in the Mediterranean, and the species of *Isidogorgia*, in which the axis is spirally twisted like a corkscrew.



Sea-fan.

Gorgonzola, tn., Italy, 11 m. N.E. of Milan; famous for its cheese. Pop. (1901) 5,134.

Gorham, GEORGE CORNELIUS (1787-1857), Anglican clergyman, born at St. Neots, Huntingdonshire. He came into collision with the bishop of Exeter (Dr. Phillpotts) in 1847 over doctrinal matters concerning the rite of baptism, and much acrimonious discussion ensued. After presentation to the living of Bramford Speke in North Devon by the lord chancellor, the bishop refused him admission to the benefice on account of alleged heterodox tenets. On a final appeal to the Privy Council he was instituted in 1851.

Gori, tn., Tiflis gov., Transcaucasia, Russia, on the Kura, 47 m. by rail N.W. of Tiflis. Pop. (1897) 10,457.

Gorilla (*Gorilla savagei*), one of the four living types of anthropoid apes, and the largest of the primates. It is confined to a limited area in western equatorial Africa, and is entirely a forest animal, living apparently

on various kinds of wild fruits, though it also robs the plantations of the natives. Of ferocious appearance, and in adult life at least of savage disposition, the gorilla is relatively little known. There is much difference in the external appearance of the two sexes—the male being much larger (6 ft. as against

either flat on the ground or also bent inwards. The animals live in trees in small family parties, and are said to construct rough shelters among the branches. The gorilla first became known to the scientific world about the middle of the 19th century. See Du Chaillu's *Equatorial Africa* (1861).



The Gorilla, the largest of the Anthropoid Apes.

4½ ft.), with a heavy beetling ridge over the eyes, and large and prominent tusks. The colour is black to gray or brown, the arms reaching below the knees in the upright position. On the ground the gorilla frequently walks on all fours, with the fingers doubled in, and the toes

Gorinchem, or GORKUM, tn., Netherlands, prov. S. Holland, on the Merwede, 25 m. S.E. of Rotterdam. It has fortified gateways (17th century) and other interesting examples of Dutch architecture. There are salmon fisheries, and some trade in grain, hemp, and cattle. Pop. (1899) 11,853.

Goring, LORD GEORGE (1608-57), English soldier, was made governor of Portsmouth by the Parliamentarians in 1638. He declared for the king in 1642, was taken prisoner by Fairfax (1643) and sent to the Tower, but was exchanged for the Earl of Lothian (1644). He commanded the left wing of the Royalists at Marston Moor, and took part in the second battle of Newbury (1644).

Gorkum, Netherlands. See GORINCHEM.

Gorky, MAXIM, pseudonym of ALEKSEI MAXIMOVITCH PYESHKOV (1868), Russian novelist, born at Nijni-Novgorod. He tried his hand at various callings, being a turnspit on a Volgan steamer, workman in a biscuit factory, a hewer of wood, and so forth. In 1893 appeared his first indisputable masterpiece, *Chelkash* (Eng. trans. 1901); and in 1900 his first romance, *Foma Gordyeev* (Eng. trans. 1901). A collection of his works, under the title of *Razskazui*, was begun in 1901. Gorky is the most original and popular of modern Russian writers. His realism is of the sincerest type; he is the chronicler *par excellence* of Russian vagabondage; and his pregnant style and incisive irony are reminiscent of Swift. Other English translations include *Tales from Gorky*, by R. Nisbet Bain, with a biography (1902); *The Orloff Couple and Malva* (1901); *The Outcasts* (1902); *Three of Them* (1902); *Creatures that Once were Men* (1905). His play, *The Lower Depths*, was represented at the Court Theatre in London in November 1903. In the strike troubles at the beginning of 1905 Gorky was imprisoned for his outspoken sympathy with the anarchical elements of Russian society. See Dillon's *M. Gorky* (1902), and Poritzky's *Heine, Dostojewski, Gorky* (Essays; 1902).

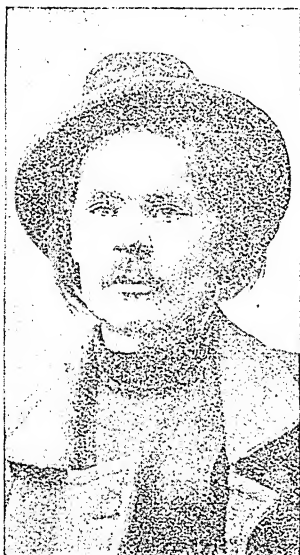
Gorlice, tn., prov. Galicia, Austria, 42 m. by rail S.E. of Tarnow, with naphtha manufacture. Pop. (1900) 6,458.

Görlitz, tn., prov. Silesia, Prussia, stands on the Neisse, 62 m. by rail W. of Liegnitz. It manufactures cloth, mixed woollen goods, machinery, glass, bricks, and other commodities. The town possesses some fine Gothic churches (especially St. Peter and St. Paul, built in 1423-97, one of the noblest churches in Eastern Germany) and a 14th-century town hall. Boehme the mystic lived and died in Görlitz. Pop. (1900) 80,931; (1905) 83,722.

Gornergrat, viewpoint (10,289 ft.) S.E. of Zermatt, in the Monte Rosa group of the Pennine Alps, Switzerland. A mountain railway was opened in 1898 from Zermatt.

Goroblagodat, mining dist. of the Urals, in Perm gov., E. Russia. It comprises the foundries of Kushvinsk, Turinsk, and Baranchinsk, the gold mines of Kushvinsk, the quarries of Tochilnogorsk, and the works of Serebriansk, Nijni-Turinsk, and Verkne-Baranchinsk. In this region live more than 50,000 people, of whom 20,000 are miners and metal-workers, all grouped around Mt. Blagodot, which lies 127 m. E.N.E. of Perm city. Here gold is found in combination with platinum.

Görres, JAKOB JOSEPH VON (1776-1848), German publicist, was born at Koblenz. From 1800 to 1814 he was professor at the Koblenz gymnasium, and for the next two years was director of public instruction for the Koblenz district. In 1814 he was recognized as the leader of the German press,



Maxim Gorky.

but in 1819 was impeached for high treason, together with Arndt and Jahn, and fled to France. In 1827 he received a professorship at Munich. It was at the suggestion and with the help of Brentano that he published *Die deutschen Volksbücher* (1807). He became also one of the leaders of the Ultramontane party, but pleads for a kind of Christianized Brahmanism, obviously the result of a superficial study of Oriental religious systems (*Christliche Mystik*, 1836-42; Eng. trans. of selections, 1883). A collected edition of his political works, in 6 vols., was issued in 1854-60; a selection, edited by Max Koch, forms part of vol. cxlvi. of *Kürschners Deutsche Nationalliteratur*. His *Life* has been written by J. N. Sepp (1896).

Gorst, SIR JOHN ELDON (1835), English politician, was born at Preston. He entered the House of Commons for Cambridge in 1866; represented Chatham in 1875-92, and Cambridge University since 1892. He was one of the most active members of the Fourth party; has been solicitor-general (1885-6), under-secretary for India (1886-91), and financial secretary to the Treasury (1891-2). He represented Britain at the Berlin Labour Congress (1890), and the Labour Commission (1891-3) was largely due to his initiative. He was one of the vice-presidents of the Committee of Council on Education, being first appointed to this position in the Marquis of Salisbury's third administration (1895-1900), and was confirmed in it when the government was again returned to power in the latter year. But when Mr. Arthur Balfour formed his first ministry in July 1902, Sir John Gorst was excluded from office. He is a clever debater.

Gorton, suburb of Manchester, Lancashire, England.

Gortschakov, or GORCHAKOV, noble Russian family. (1.) PETER took part in the defence of Smolensk against Sigismund III. of Poland (1609-11). (2.) ALEXANDER (1764-1825), general, distinguished himself at the storming of Praga, near Warsaw, and became in 1812 head of the Russian war department. (3.) ANDREAS IVANOVITCH (1768-1855), general, served in 1799 under Suvorov (Suwaroff) in Italy and Switzerland, and in 1812-14 held a command at the battles of Smolensk, Borodino, Dresden, and Leipzig. (4.) PETER DIMITRIEVITCH (1790-1868), general, served against Turkey, and in the Napoleonic campaigns of 1813-14; in 1820 quelled an insurrection in the Caucasus; in 1828-9 fought once more against the Turks; commanded the Russian left wing at the battle of the Alma and at Inkerman. (5.) ALEXANDER MICHAELOVITCH (1798-1883), statesman, born at St. Petersburg, was Russian ambassador at Stuttgart and at Vienna (1854-6), and was appointed to the ministry of foreign affairs (April 1856). His policy was animated at first by hostility to Austria, owing to her behaviour over the Crimean war; and after 1870, especially after 1878, by an endeavour to secure a rapprochement with France. After his appointment as chancellor (1863) he was for some years the most influential statesman in Europe. But the repudiation of the treaty of San Stefano, framed by him, marked the decline of his power, and he was succeeded as foreign minister by De Giers (1882). See

Biography, in English, by Charles Marvin (1887); and Kłaczko's *Two Chancellors* (Eng. trans. 1876). (6.) MICHAEL (1795-1861), Russian general, cousin of the foregoing, gained experience against Persia (1810) and the French (1812-14), and saw active service in the Turkish war of 1828-9. In the Polish war (1831) he took part in the battles of Grochlow and Ostrolenka and the storming of Warsaw. His energy and rapidity of movement led to the Hungarian capitulation at Vilagos. In the Crimean war he showed an unexpected want of enterprise, which led to the defeat on the Tchernaya, a disaster retrieved, however, by his brilliant defence of Sebastopol.

Gortuna, or GORTYN, ancient city, Crete, at the S. side of the island. It had temples to Apollo, Pythius, Artemis, and Zeus, and the fountain of Sauros was in the vicinity. Under the Romans the town became the metropolis of the island. Near the village of Hagii Deki, in 1884, Halbherr discovered a Greek inscription, which furnished a code of family law existent about 400 B.C. See Bücheler and Zitelmann's *Das Recht von Gortyn* (1885).

Görtz, GEORG HEINRICH VON (1668-1719), a Holstein statesman, born in Franconia (Bavaria), who won the confidence of Charles XII. at Altranstädt (1706), and formally entered the Swedish service (1714). Charles XII. entrusted him with the finances and the conduct of foreign affairs in 1715. After the death of Charles, Görtz was arrested and beheaded by the Swedish senate. See a *Memoir*, in German, by Von Moser (1776).

Gory Dew, a reddish slimy alga often seen on damp walls.

Görz and Gradisca. (1.) Prov. of the Austrian Küstenland (or coastland), lies between the Julian Alps and the N. end of the Adriatic. It formed part successively of the ancient Illyria and the duchy of Friuli; then from the 11th century it was a separate duchy, and has belonged to Austria since 1500. Area, 1,126 sq. m. Pop. (1900) 232,338, of whom over two-thirds are Slavs and nearly one-third Italians. (2.) GÖRZ, cap. of the above province, is an archiepiscopal see and winter resort, 34 m. by rail N.N.W. of Trieste. It has a 14th-century cathedral and the former castle of the counts of Görz, and manufactures silks, cottons, etc. Pop. (1900) 25,432.

Goschen, GEORGE JOACHIM, VISCOUNT (1831), English statesman, was born in London, being descended from a Dresden publishing family. He first entered the House of Commons for the City of London in 1863. In 1880 he exchanged this constituency

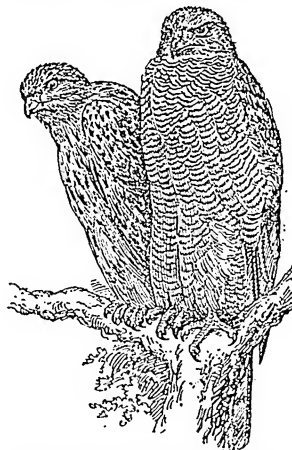
for Ripon, and that again in 1885 for the eastern division of Edinburgh. From 1887 to 1900 he represented St. George's, Hanover Square, London. In 1865 he was appointed vice-president of the Board of Trade in the Russell administration, but became chancellor of the duchy of Lancaster (1866). In Mr. Gladstone's first ministry he was President of the Poor-law Board (1868-71), and subsequently First Lord of the Admiralty (1871-4). From May 1880 to April 1881 he was engaged on a special mission to Constantinople as British ambassador. When Mr. Gladstone announced his Home Rule policy, Mr. Goschen was one of its most effective opponents. In the Salisbury government (1886-92) he was Chancellor of the Exchequer from 1887 to 1892, and made his tenure of the office memorable by his scheme for the conversion and redemption of the National Debt (1888-9). When the Unionist government was formed in June 1895, Mr. Goschen returned to his old place at the Admiralty as First Lord. This office he retained till 1900, when he resigned, and was raised to the peerage. Viscount Goschen, who is a banker, and was a director of the Bank of England from 1856 to 1865, is the author of the phrase 'splendid isolation' in relation to England's international position in 1893. In the divisions of the Unionist party (1903-5) on the question of tariff reform Lord Goschen took a prominent place as an uncompromising free trader. He has written *The Theory of Foreign Exchanges* (1863; numerous eds.), *Life and Times of G. J. Goschen* (1903), and *Essays and Addresses on Economic Questions* (1905).

Goshawk (*Astur palumbarius*), a hawk abundant in many of the forest regions of Europe, but rare in the British Isles. The upper part of the body is ash-brown, with four broad dark bands on the tail; the under part white, barred with black. The bird is bold and rapacious, and remarkable for the skilful turns by means of which it follows every movement of the quarry. In Scotland the peregrine falcon is sometimes called goshawk.

Goshen. (1.) Part of ancient Egypt, the gift of Pharaoh (Gen. 47:6) to Jacob and his family; lay on the Pelusian arm of the Nile delta. Its capital was Kesem (of the inscriptions), the Septuagint Gesem, classical Phacusa, modern Fakus (N.E. of El-Zagazig and S. of the ruins of Tanis). What the relation was between the 'land of Goshen' and the 'land of Rameses' (Gen. 47:11) is not quite clear. See Naville's *The Shrine of Saft-el-*

Henneh and the Land of Goshen (1888). (2.) Or GOSCHEN, LAND OF, part of Bechuanaland, British S. Africa; so designated by Boer filibusters in 1882. The disputes between Boers and natives along the W. frontier of the Transvaal were settled by the Warren expedition of 1884-5. (3.) Capital, Elkhart co., Indiana, U.S.A., on the Elkhart R., 25 m. N. of Warsaw; has manufactures of wagons, agricultural implements, and pumps, and a lumbering industry. Pop. (1900) 7,810.

Goslar, tn., prov. of Hanover, Prussia, at the N. foot of the Harz Mts., 31 m. by rail W. of Halberstadt; is an old historic place, with numerous mediaeval houses and fine old churches. Its emperors' house, built in the 11th century, was for two hundred years the place of residence of the German emperors; it was restored in 1867-80, and decorated with frescoes by Wislicenus. Goslar is the birthplace of Maurice, marshal and count of Saxony (1696-1750). Immediately S. of the town rises the Rammelsberg (2,087 ft.), in which silver, lead, copper, gold, zinc, sulphur, and sulphuric acid have been mined since the 10th century. Pop. (1900) 16,403.



Goshawk: Adult Female and Immature Bird.

Gosnold, BARTHOLOMEW (d. 1607), English navigator, sailed from Falmouth (March 25, 1602) in command of the *Concord*, and on May 14 discovered Cape Cod. Having formed a chartered company (1606), he discovered the Virginian capes and founded Jamestown. See Brereton's *Brief and True Relation of Gosnold's Voyage* (new ed. 1901).

Gospel, in the New Testament, signifies the 'good news of the kingdom,' or (as often in the epistles) the 'good news of God through Christ;' with Paul it is

sometimes equivalent to 'preaching of the good tidings' ('my gospel,' Rom. 2:16). In Mark 1:1 the word seems to have the quasi-technical sense of a narrative of Christian truth, and this is found still more developed in the Didache; but Justin Martyr (d. c. 165) is the first to apply it to the four gospels. See GOSPELS.

Gospellers, a word applied by the Roman Catholics of the period to Wycliffe and his followers; also to a class of people during the reformation who considered that the doctrine of predestination, involving their ultimate salvation, absolved them from obligation to keep the moral law. The name is also given to the priest who in the Anglican communion service reads the gospel from the gospel (north) side of the altar.

Gospels, THE FOUR, purport to narrate the life and teaching of Jesus of Nazareth, and practically form our only documentary source of information regarding Him. They are traditionally associated with the names of Matthew, Mark, Luke, and John—i.e. either apostles or members of the apostolic circle—but with the exception of the fourth (John 21:24), they give no definite indication of their authorship. According to the fragments of Papias (c. 140) preserved by Eusebius, the second gospel was composed by Mark from the reminiscences of Peter, and the first by Matthew the apostle, said to have been written in Hebrew. The third, which finds its sequel in the Acts of the Apostles, was ostensibly the work of the diarist of the 'we' passages in the latter book—i.e. Luke, the companion of Paul. John stands apart from the others, its contents, method, and style being very different from theirs. But there is a remarkable similarity amongst the first three, in view of which, and from the fact that they give the same common summary and survey of the public life of Jesus, they have been aptly named (by Griesbach) the 'synoptics.' Thus, the events they select, and the order in which they chronicle them, are approximately the same—cf., for example, Mark 2:1-28, Matt. 9:1-17 (12:1-8), and Luke 5:17-6:5; further, the language in which the parallel sections are written shows a remarkable degree of resemblance, extending to the employment of the same peculiar turns of expression—e.g. the asyntactical bracketed phrase in Mark 2:10, Matt. 9:6, Luke 5:24; again, we sometimes find two of them agreeing at a particular point as against the third, and there is a large amount of discourse material common to Matthew and Luke, but omitted by Mark. It is, in fact, the re-

markable combination of *parallelism and unconformity* which forms what is called the 'synoptic problem,' though it is, of course, the parallelism which raises it. To account for the latter there have been proposed (1) the theory of borrowing—i.e. direct use of one (or two) by another in a variety of permutations (Augustine, Griesbach); (2) the theory of a proto-gospel, either as a document or documents (Eichhorn, Schleiermacher), or as an oral tradition (Gieseler, Westcott) underlying all the three. But the explanation which has of recent years gained most acceptance is (3) the 'two-documents theory' (C. H. Weiss, H. J. Holtzmann, and the majority of contemporary scholars), which has the merit of simplicity, of combining the main features of the others, and of being reconcilable with tradition. According to this, (a) Mark is the earliest of the three synoptics, and is an attempt to fix in a comprehensive, orderly, and permanent form a large mass of floating tradition, both oral and written, regarding our Lord's life; further, it is supposed that, prior to the composition of Mark, there was in existence a considerable body of discourses or 'oracles' (*logia*) of the Lord, and this collection, designated (b) the *logia document*, was probably a free rendering into Greek of the 'gospel' which, on the testimony of Papias, Matthew wrote in Hebrew. Our present Matthew and Luke are then, in the main, combinations of (a) and (b); but each, besides using these documents with considerable freedom, has drawn from other sources, both of narrative and discourse. It is still a matter of controversy among advocates of the theory whether Luke had our Matthew before him as he wrote, but it is agreed that in any case the use he makes of it is of the slightest. The two-document theory thus places the synoptics in the order Mark, Matthew, Luke, and throws new light upon, while essentially confirming, the testimony of Papias and the ancient church tradition. Though it is certainly hostile to any mechanical conception of inspiration, it entirely discredits the tendency-theories of the Tübingen school; and in tracing the bulk of both narrative and discourse to apostolic hands, it largely corroborates the traditional view of the reliability of the first three gospels as embodying the testimony of firsthand witnesses. The fourth gospel, as has been said, stands by itself (see JOHN, GOSPEL ACCORDING TO). See Adeney's *Bib. Introd.* N.T. (1900); Zahn (1898), H. J. Holtzmann (1892), Jülicher (1894), Marcus Dods (1889), Weiss

(1886; Eng. trans. 1897); Rushbrooke's *Synoptikon* (1880); Huck's *Synopsis* (1892); A. Wright's *Synopsis* (1896), valuable for study of the facts; Stevens and Burton's *English Harmony* (1894); also Holtzmann's *Die Synoptiker* (3rd ed. 1902); Westcott's *Study of Gospels* (8th ed. 1895); A. A. Jolley's *Syn. Prob. for Eng. Readers* (1893); A. Wright's *Comp. of Four Gospels* (1890).

GOSPELS, HARMONY OF THE, a comparison of the four evangelical narratives made for the purpose of exhibiting their mutual consistency, and combining them in a single connected history. The fourth gospel, which contains by far the largest mass of independent matter, can only be harmonized with the synoptics (see GOSPELS) on the hypothesis of several visits of Jesus to Jerusalem, of which the latter gave no hint. But the insuperable difficulty appears when we try to reconcile the variations in the parallel sections of the synoptics themselves: cf., for example, the narrative of the calling of the first disciples (Mark 1:16-20; Matt. 4:18-22; Luke 5:1-11—given in the harmony of the *King's Printers' Aids*, as relating to a single event), in which the account of Luke simply defies amalgamation with the others. The real harmony, in truth, is not to be attained by forcing the gospels into a mere historic, let alone a verbal, concord, but is found rather in the marvellously self-consistent figure of Jesus, which the gospels, each in its own manner, portray. The *Diatessaron* of Tatian is often spoken of as the earliest harmony, but it was rather an attempt to extract, by means of amalgamation and omission, a unified story out of the four. That of Theophilus, bishop of Antioch, seems to have been of a like character; while those of Ammonius (3rd century) and Eusebius (4th century) were of a more scholarly kind. Osiander's *Harmonia Evangelica* (1537) adopts the easy if drastic method of explaining discordant accounts of (presumably) the same event by referring them to different events. The place of harmonies has been in modern times largely taken by *synopses* in Greek or English. See GOSPELS; also Waddy's *A Harmony of the Four Gospels in the Rev. Ver.* (1895).

GOSPORT, mkt. tn. and port at the W. entrance of Portsmouth Harbour, Hampshire, England, of which naval port it forms a part. Its naval institutions are the Clarence Victualling Yard, Haslar Hospital, and barracks. The industries include yacht-building, and the manufacture of anchors, chain cables, and sails. Pop., including Alverstoke (1901) 28,879.

Goss, Sir JOHN (1800-80), English musical composer and author, was born at Fareham, Hampshire, and was a chorister of the Chapel Royal (1811-16). Next he became organist of St. Luke's, Chelsea (1824), and afterwards (1838) at St. Paul's Cathedral. His works include anthems, hymns, and glees.

Gossamer, the light filamentous threads which are found abundantly in autumn, both floating in the air, and also attached to the surface of bushes and plants. They are formed on fine sunny days in autumn by young spiders which have not yet made their full growth.

Gossan, a Cornish miners' term for the weathered back or outcrop of a lode. The gossans are often richer than the vein in depth, and being entirely oxidized and thoroughly decomposed, are easily worked and treated by extraction methods.

Gosse, Edmund William (1849), English critic and miscellaneous writer, was born in London, son of P. H. Gosse, the zoologist. He was appointed assistant librarian in the British Museum (1867), but in 1875 he was removed to the Board of Trade as translator. In February 1904 he was appointed librarian to the House of Lords. He published a volume of *Madrigals, Songs, and Sonnets* (with J. A. Blaikie) in 1870, and *On Viol and Flute*, poems, in 1873. Those were followed by *Studies in the Literature of Northern Europe* (1879); *New Poems* (1879); *A Life of Gray* (1882); *Seventeenth Century Studies* (1883). From 1884 to 1890 he was Clark lecturer on English literature at Trinity College, Cambridge. Since that date he has published *From Shakespeare to Pope* (1885); *Raleigh* (1886); *Life of Congreve* (1888); *History of Eighteenth Century Literature, 1660-1780* (1889); *Life of P. H. Gosse* (1890); *The Jacobean Poets* (1894); *Critical Kit-Kats* (1896); *Firdausi in Exile*, a volume of poems (1885); *In Russel and Silver*, poems (1894); *Robert Browning*, personalia (1890); *Life and Letters of John Donne* (1899); *Hypolympia* (1901); *Illustrated Record of English Literature* (vols. iii. and iv., 1903-4); *Life of Jeremy Taylor* (1904); *Cowentry Patmore* (1905); and *Sir Thomas Browne* (English Men of Letters Series, 1905). He has edited a number of works in English classics, and translated several of the works of Ibsen.

Gosse, Philip Henry (1810-88), English naturalist, born at Worcester. He was engaged in teaching in the United States and elsewhere, assiduously observing and collecting. Returning to England (1839), he devoted

himself to marine zoology. He wrote *A Naturalist's Rambles on the Devonshire Coast* (1853); *The Aquarium* (1854); *Actinologia Britannica* (1858-60); *Manual of Marine Zoology* (1855); *The Romance of Natural History* (1860). See *Life* by Edmund Gosse (1890).

Gossypium, a genus of tropical plants belonging to the order Malvaceæ. They are easily grown in a rich, well-drained soil under glass in Britain. The seeds, when ripe, are covered with down, especially those of the Barbados species, *G. Barbadosense*, which constitutes the cotton wool of commerce.

GOT, FRANÇOIS JULES EDMOND (1822-1901), French comedian, born at Lignerolles (dep. Orne); made his début at the Comédie Française (1844). Becoming a member of the Comédie Française (1850), he acted with marked success at his own theatre, at the Odéon (where, in 1866, he appeared in Augier's *Contagion*), and in London. Though his interpretation of the leading rôles in Molière's masterpieces was successful, it is in more modern dramas, such as *Les Effrontés*, *Le Fils de Giboyer*, and *Les Fourchambault* of Augier, that his triumphs have been achieved.

Göta. (1.) Canal in S. Sweden which connects the Kattegat with the Baltic by way of Lake Wener and Lake Wetter; it reaches the Baltic at Mem, below Söderköping. The total length is 125 m.; the length of the actually canalized stretch is 55 m. Through the exertion of Count Platen, with assistance from Telford, it was begun in 1810 and completed in 1832. (2.) River in Sweden, flowing from the s.w. end of Lake Wener, forming shortly afterwards the Trollhätta waterfalls (108 ft.), and reaching the Kattegat after a course of 68 m. It is navigable throughout, the falls being avoided by a canal (1793-1800).

Götarike, one of the three historical divisions of Sweden, occupying the s. of the country, and comprising the modern counties of Malmöhus, Christianstad, Blekinge, Halland, Kronoberg, Jönköping, Kalmar, Gotland, Göteborg and Bohus, Elfsborg, Skaraborg, and Östergötland. Area, 35,788 sq. m. Pop. (1900) 2,696,233.

Götha, ALMANACH DE, is 'a genealogical, diplomatic, and statistical annual,' which has been published since 1763 by the Götha printing-house of Justus Perthes. There are two editions, the larger one in French and the other in German. Especially does it take pains to record governmental and diplomatic changes. A section is devoted to the genealogy of

royal families, minor princes, and distinguished members of the nobility. The other sections contain the Corps Diplomatique, and a statistical statement as to the population, trade, and similar matters, of all civilized states.

Götha. (1.) Town, Germany, alternately with Coburg capital of duchy of Saxe-Coburg-Götha, 17 m. by rail w. of Erfurt. The dominant feature is the ducal castle of Friedenstein (1643), crowning a hill s. of the old town. Here also are the former ducal palace and the castle of Friedrichsthal. Götha is one of the busiest industrial towns in Thuringia, and produces sausages, toys, shoes, rubber tubes, sugar, etc. Here, too, is the geographical institute of Justus Perthes. The famous *Almanach de Götha* and *Petermann's Mittheilungen* are published in the town. Pop. (1900) 34,651. (2.) DUCHY OF. See SAXE-COBURG-GÖTHA.

Gotham, MAD MEN OF, heroes of one of the best-known old English collections of *facetiae*. Gotham is a village of Nottinghamshire, whose inhabitants are credited with every sort of idiotic absurdity, as building a wall round the cuckoo to secure eternal spring. The stories first appeared in print about 1550, under the title *Merrie Tales of the Mad Men of Gotham*. Abdera in Thrace had a like reputation in antiquity. Similar stories are current in nearly all parts of the Old World, the Swabians and Schilbürger being the butts in Germany, the people of St. Maixent in France, of Kampen in Holland, and of Dinant in Belgium. There are modern reprints of the *Merrie Tales* by Halliwell (1840), in Hazlitt's *Shakespeare Jest-books* (1864), Cunningham's *Amusing Prose Chap-books* (1880). For the whole subject see Clouston's *Book of Noodles* (1878).

Gothard or **GOTTHARD**, ST., PASS OF, in the Reuss valley, Swiss canton of Uri (6,936 ft.). It is traversed by a carriage road leading from Göschenen to Airolo and Bellinzona in the Ticino or Tessin valley. Known since the 13th century, it was an important highway from Germany to Italy. The pass was made practicable for carriages in 1820-30, and was pierced by a railway tunnel 9½ m. long and 26 ft. wide, begun in 1871, and opened in 1882. The piercing was done by mechanical drills, worked by air compressed to seven atmospheres, at an average rate of 15 ft. per day.

Göthenburg, also **GOTTENBURG** (Swed. *Göteborg*), the second largest city in Sweden, cap. of Göteborg and Bohus co., and seat of a bishopric, situated on river Göta, near its mouth. In

the centre of the old town are Gustavus Adolphus's statue by Fogelberg, and the new bourse. Gothenburg is remarkable for its beautiful parks and pleasure-grounds. Of its churches, the most remarkable are the cathedral (re-built in 1815) and the 'German' church. The museum (founded in 1833) is housed in the old East India Company's buildings (re-modelled 1895). The city has shipbuilding and machinery factories, sugar refineries, breweries, tanneries, weaving and spinning factories, etc. Owing to its excellent harbour, which is almost always free from ice, Gothenburg has a large trade. The principal exports are iron, timber, wood pulp, corn, butter, fish, calcium carbide, and glass bottles; the principal imports, colonial wares, machinery, and coal. The chief trade is with Britain. Gothenburg was founded by Gustavus Adolphus in 1619. At first it was peopled mostly by foreigners, especially Dutch. Pop. (1901) 132,111.

Gothenburg System. See PUBLIC-HOUSE TRUSTS.

Gothic Architecture. See ARCHITECTURE.

Gotland. See GOTLAND.

Goths, a people of Germanic race, who are first heard of on the southern shores of the Baltic. The similarity of name has led many scholars to see ethnic kinship between the Goths and the Getæ, who indeed did become fused with them subsequently. In the 2nd century A.D. probably they migrated to the south, carrying with them a number of smaller tribes, who are sometimes classed under the general term Goth—the Vandals, the Gepids, the Heruli, the Burgunds, and others. Early in the 3rd century, at any rate, we find the Goths settled on the Black Sea, between the Don and the Danube. The eastern portion of the nation came to be known as the Ostrogoths, or East Goths, and the western as the Visigoths, or West Goths. They first came into hostile contact with the Roman empire about the middle of the 3rd century, and in a terrible battle at Abritta (251) in Moesia the Romans suffered a crushing defeat, the Emperor Decius being among the killed. For the next eighteen years the Goths enjoyed unlimited opportunities for plunder in the Balkan peninsula and in Asia Minor, burning the great temple of Diana at Ephesus, and plundering Athens, till they were checked, and eventually subdued, by the Emperor Claudius at Naissus (Nish in Serbia) in 269. His successor, Aurelian, made a wise treaty with the Goths, leaving them in undisturbed posses-

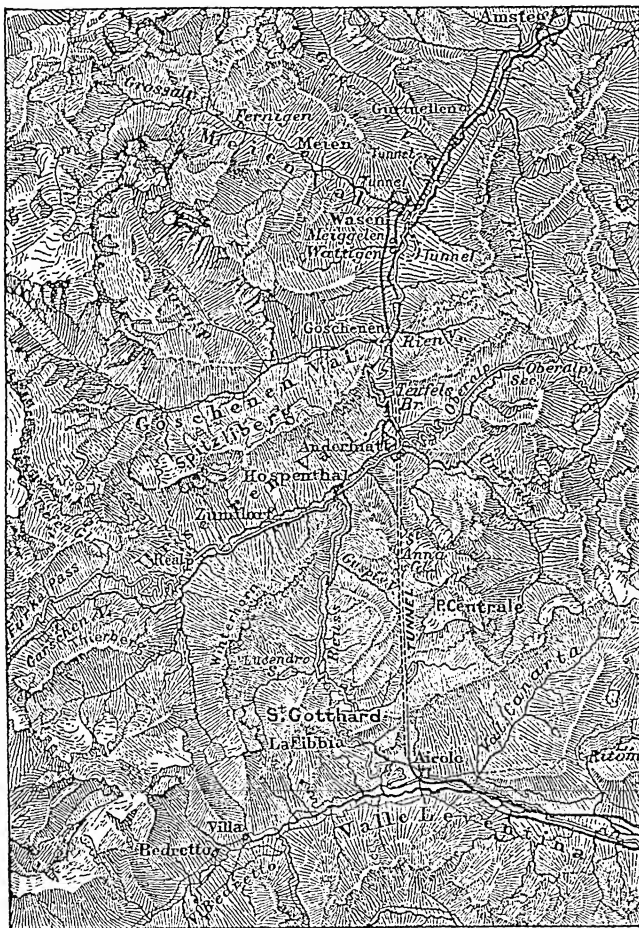
sion of the left bank of the Danube, and for one hundred years there was peace between them and the empire.

It was during this period that Bishop Wulfila, or Ulfilas, laboured for forty years amongst the Goths, and saw as the fruits of his labour the conversion of the entire people to the Arian branch of Christianity. It is a remarkable fact that the Goths

are thus of immense importance to philologists. Meantime the Eastern Goths prospered, until, in the middle of the 4th century, Ermanric, one of their kings, ruled from the Gulf of Bothnia to the Black Sea. But upon the Ostrogoths in 375 fell the invading army of the Huns, who subjugated and absorbed them, so that, at the famous battle of Chalons, part of the army

venge, and in 378, near the modern Adrianople, they defeated and slew the Emperor Valens. Under his successor, the Emperor Theodosius, the relations of the Goths and Romans became peaceful; but when, on his death in 395, the empire was divided between his two sons, Arcadius and Honorius, trouble began. The Goths, under their king Alaric, ravaged Greece. But Stilicho, ruler of the Western empire in the name of Honorius, having intervened, Alaric in 402 invaded Italy, but was twice defeated (at Pollentia and Verona), and forced to retire by Stilicho. In 408, Stilicho being dead, Alaric again invaded Italy, and swept all before him. Rome was three times besieged, and the third time it was sacked and plundered (410). Alaric died while engaged in the siege of Ravenna, to which Honorius had fled; and his successor, Ataulf, induced the Visigoths to turn their arms against his enemies in Gaul. As a reward for these services, their king, Wulfila, was granted (419) Aquitania, the richest province of Gaul. His successors increased their territory, till under Euric (466-484) they not only held all Gaul south of the Loire and west of the Rhone, but subdued the greater part of the Iberian peninsula. After the battle of Volad, near Poitiers (507), in which they were defeated by Clovis, king of the Franks, the Goths finally (about 510) abandoned all their French territory except a strip on the Mediterranean. Henceforth they were a Spanish power. At length, as a matter of political necessity, their king, Reccared (586-600), became a convert to Catholicism, and the Visigoths, weary of ecclesiastical isolation, were converted by battalions. The clergy, as the price of this political deal, succeeded in making themselves supreme. Witica (701-710), however, tried to reform the relations of church and state. Roderic was the last of the Goths, falling in battle with the Moslem invaders in 711, near Jerez.

The Ostrogoths, released from their servitude by the defeat of the Huns at Chalons, settled in Pannonia, along the middle Danube, and for a time were busy as enemies or allies of the empire, till their young king Theodoric obtained permission to invade Italy, as the agent of the empire, to drive out Odoacer, who had usurped the throne of the Western empire. This was with some difficulty accomplished, with the help of certain Visigoths (489-493), and Theodoric, in fact, if not in name, became king of Italy. He ruled wisely and well, and Italy enjoyed a pros-



St. Gothard Pass.

were the most tolerant of religionists, and it was not till the Visigoths of Spain had become Catholics that they developed any persecuting tendencies. Bishop Wulfila reduced the language to writing—ignoring the runic characters as being heathenish in associations—and translated the Bible into Gothic. Of his work parts have survived. They are the earliest writings we possess in any Teutonic language, and

of Attila, which the Visigoths helped to defeat, was composed of Ostrogoths, who had been servants of the Huns till that date (451). During the intervening period the Ostrogoths have no history, save as regards that small section which was allowed by the Emperor Valens to cross the Danube with the Visigoths into Thrace, to escape the Huns. But the injustice of the Byzantines provoked them to re-

perity she had not known for centuries. After the death of Theodoric the Emperor Justinian sent his famous general Belisarius to subdue Italy. Belisarius got possession of Rome, where for a whole year (537-538) he was vainly besieged by Witigis, who had been elected (536) king of the Goths. And Belisarius had practically subdued the country when he was recalled, through court jealousies, to Constantinople. Although sent back to Italy in 544, Belisarius could effect nothing against the soldier and ruler of genius whom the Goths had made king over them. This was Totila, who rapidly recovered Italy. Justinian at last awoke to the seriousness of the task, and entrusted it to his aged chamberlain Narses, who led a huge army to invade Italy from the north, and fought a decisive battle at Taginae, now Tadino (552), where Totila was killed. Under the newly-elected king, Teia, the Goths made so desperate a stand at Mons Lactarius, near Vesuvius, that the imperial general was glad to grant them a safe-conduct out of Italy. Their subsequent history is not known. See H. Bradley's *Goths* (1888); Hodgkin's *Italy and her Invaders* (1880-99), and *Life of Theodoric* (1891); Martroye's *L'Occident à l'Époque Byzantine: Goths et Vandales* (1904).

Gotland (i.e. GAUTLAND, incorrectly GOTHLAND), the largest of the Swedish islands, in the Baltic, about 40 m. E. of Sweden. Area, 1,203 sq. m. The coasts are steep, the interior level, with an average height of from 60 to 100 ft. The former morasses have now been for the most part drained. The climate is mild. Agriculture and cattle-breeding are the chief occupations. There are good fisheries. Lime is burnt, and there is some output of so-called Gotland marble. As early as the 8th century Gotland was tributary to Sweden. In 1030 St. Olaf probably forced Christianity on the Gotlanders. Even before that time Wisby had long been one of the most important trading towns, not only in Scandinavia, but in N. Europe, and so continued until near the end of the 14th century. Denmark and Sweden held it alternately from 1361 to its cession to Sweden in 1645. Pop. (1900) 52,781.

Goto (*Goto Retto*), or **GOTTO**, group of islands, Japan, 50 m. W. of Nagasaki.

Götterdämmerung. See RAGNARÖK.

Gottesberg, tn., prov. Silesia, Prussia, at the N. foot of the Riesengebirge, 53 m. by rail S.W. of Breslau; has coal mines and linen factories. Pop. (1900) 8,966.

Gottfried von Strassburg, a German writer of the 13th century, author of an unfinished poem, *Tristan und Isolde*. It was written about 1210, and had for its basis the *Tristan* of Thomas of Brittany, an Anglo-Norman poet of a very high order. It is difficult to say how much of the charm of Gottfried's work is due to his source, and how much to his own genius. While inferior to Wolfram von Eschenbach in depth of thought and poetical conception, he decidedly excels him in ease and grace of style. It is this poem which is the basis of Wagner's music drama *Tristan und Isolde*. See *TRISTAN*; also *Tristan*, ed. Bechstein, 1889 (*Deutsche Classiker des Mittelalters*, vols. vii. and viii.); modern German trans. by Simrock, 1875; and *Tristan and Iseult* (abridged English prose trans., 2 vols. 1899, by J. L. Weston).

Gotthard, ST. See GOTHARD.

Gotthelf, JEREMIAS. See BITZIUS, ALBERT.

Göttingen, tn., prov. Hanover, Prussia, 36 m. by rail N.E. of Kassel; is the seat of a famous university founded in 1737, and attended by nearly 1,600 students in 1904-5. Göttingen manufactures sausages and other eatables, mathematical and scientific instruments, and cloth, chemicals, sugar, books, and beer. In 1626 the town was taken by Tilly. Göttingen is famous for its Academy of Sciences, founded by Haller in 1751. It also gave name to a distinctive school of poets and other writers in German literature, which numbered among its members J. H. Voss, Stolberg, Hölty, Leisewitz, and others. Pop. (1900) 30,234.

Gottschalk (d. 868), a monk who became indoctrinated with Augustine's views on predestination and original sin at the monastery of Orbais, in the diocese of Soissons, for which he was condemned to imprisonment for life, and died in prison. See *Life*, in German, by Borrasch (1868), and, in French, by Gaudard (1888).

Gottschall, RUDOLF VON (1823), German dramatist, novelist, and miscellaneous writer, was born at Breslau; devoted himself to literature and the drama, the revolutionary years from 1848 onwards being greeted by him with the tragedies *Lambertine von Mericourt* (1850) and *Ferdinand von Schill* (1851). *Pitt and Fox* (1854), *Mazeppa* (1859), and *Katharina Howard* (1872), met with marked success on the German stage. *Die Göttin* (1853), *Carlo Zeno* (1854), and *Merlin's Wanderungen* (1887) are among his other poems; while his novels include *Welke Blätter* (1877;

Eng. trans., *Withered Leaves*, 1879), *Im Banne des Schwarzen Adlers* (1875), *Das Goldene Kalb* (1880), and *Die Tochter Rübezahl* (1889). His dramatic works were republished in 1884, and his poems and his essays in *Unsere Zeit* (which he edited 1864-88) appeared in various other volumes. He has also written a useful *Deutsche Nationalliteratur des neunzehnten Jahrhunderts* (1854; 7th ed. 1902), *Poetik* (6th ed. 1893), and *Zur Kritik des modernen Dramas* (1900).

Gottsched, JOHANN CHRISTOPH (1700-66), German writer, born at Judithenkirch, near Königsberg. At Leipzig he became president of the *Deutschliebende poetische Gesellschaft*; was appointed professor of poetry in 1729, and professor of logic and metaphysics in 1734. He became somewhat of a literary pope, and did real service to German literature. In place of the affected and turgid plays of the Second Silesian school, he pleaded for a nobler drama, based on French models, himself supplying a poor example in *Der sterbende Cato* (1732). He insisted that German should be used by the learned instead of Latin, and that it should be kept free from foreign and from dialect influences. He tried to lay down the laws of poetry in his *Critische Dichtkunst* (1730), which owes much to the *Art Poétique* of Boileau; but in his attempt to reduce poetry to rules, and to make 'common sense' the one criterion, he ignored the claims of the imagination, and became involved in a literary feud with Bodmer and Breitinger of Zürich, whose side was gradually taken by all the more progressive spirits. Lessing tore Gottsched's literary reputation to shreds, and by 1750 Gellert had taken his place in popular esteem. See F. W. Danzel's *Gottsched und seine Zeit* (1848), and G. Waniek's excellent *Gottsched und die Deutsche Literatur seiner Zeit* (1897).

Gottschee, tn., prov. Carniola, Austria, 32 m. S.S.E. of Laibach, is the chief town of a duchy created in 1791, and has a castle belonging to Prince Anersperg. Many of the inhabitants, who are of German origin, get their living as hawkers. In the vicinity are the Friedrichstein ice-cave and other caverns. Pop. (1900) 2,421.

Götz von Berlichingen. See BERLICHINGEN.

Gouania, a genus of tropical shrubs belonging to the order Rhamnaceae. *G. dominicensis* is the 'chaw-stick' of Jamaica.

Gouda, or TER GOUW, tn., prov. S. Holland, Netherlands, on the IJssel, 12 m. by rail N.E. of

Rotterdam. Its principal church (1552) is famous for its 16th-century stained glass. Gouda is famous for the making of clinkers (paving-stones), and carries on a trade in cheese, which is made at Edam, etc. Pop. (1900) 22,085.

Goudelin, PIERRE (1580-1649), Southern French poet (*dial.* Goudouli), was born and died at Toulouse. He received a classical education from the Jesuits. Securing the favour of wealthy patrons, he was enabled to devote himself to literary pursuits. His pieces, slight in matter but admirable in manner, were first collected in 1617—*Le Ramelot Moundi* (*The Bouquet of Toulouse*; an enlarged edition, 1647). Cayla and Paul published a good edition of his works in 1843, but Noullet's (1887) is better. See Jourdanne's *Eloge de P. G.* (1893).

Goudimel, CLAUDE (1505-72), French musical composer, born at Besançon, founded a school of music at Rome (1540), counting Palestrina among his pupils. Later he returned to France, and set to music, in four-part harmonies, the translation of the Psalms (1551-66) by Marot and Théodore de Bèze; composed masses, motets, and songs, some of the last appearing at Lyons in a collection entitled *La Fleur des Chansons* (1574). A convert to the reformed religion, he met his death in the massacre of the Huguenots at Lyons in 1572, immediately after St. Bartholomew.

Goudy, HENRY (1848), British jurist, was born in Ireland, and joined the Scottish bar. In 1889 he became professor of civil law at Edinburgh, and in 1893 regius professor of civil law at Oxford. He is also official curator of the Bodleian Library. He edited *Manual of Local Government Law in Scotland* (1880), and the 2nd ed. of Muirhead's *Private Law of Rome* (1893), and is author of *Treatise on the Law of Bankruptcy in Scotland* (3rd ed. 1903).

Gough, SIR HUGH, FIRST VISCOUNT (1779-1869), British general, was born at Limerick. He was on active service in S. Africa, at Porto Rico, and Surinam in the West Indies. During the Peninsular war he fought at Talavera (1809), at Tarifa (1811), at Vittoria (1813), and at Nivelle (1813). After being commander-in-chief in China (1842), and successfully conducting the Maratha (1843) and Sikh (1845-9) wars, Sir Hugh Gough was raised to the peerage. He was made a field-marshal in 1862. See R. S. Rait's *The Life and Campaigns of Hugh, First Viscount Gough* (1904).

Gough, JOHN BARTHOLOMEW (1817-86), English temperance lecturer, was born at Sandgate, Kent, and at twelve was sent to

New York. He was (1842) persuaded to sign the pledge, and soon became famous as a temperance orator. He paid three visits to England. See *The Hand of Providence exemplified in the History of J. B. Gough: an Autobiography* (1846). He also wrote *Temperance Addresses* (1870), and *Sunlight and Shadow, or Gleamings from my Life Work* (1880).

Gough, RICHARD (1735-1809), English antiquary, born in London; spent his life in antiquarian pursuits. His best-known works are *History of the Society of Antiquaries* (1770), *British Topography* (1768 and 1780), *The Sepulchral Monuments of Great Britain* (1786-99), and a largely-augmented edition of Camden's *Britannia* (1789). His home was at Enfield, near London.

Goujon, JEAN (c. 1515-72), sculptor of France, called 'the French Phidias.' Born probably in Paris, the first mention of him is in 1540, in connection with the building and decoration of the cathedral and church of St. Maclou, Rouen. He was also one of the distinguished band who worked in St. Germain de l'Auxerrois, and later proceeded to Ecouen to work for the Huguenot, Constable of Montmorency (portions of his sculpture are now in the Louvre), executing there his woodcut illustrations to Vitruvius. To Paris he next went (1547), to work for Henri II. on the Old Louvre, designing the façade, the Henri II. staircase, etc. Among his finest sculptures are the *Fontaine des Innocents* (1549), the bas-reliefs of the base being now in the Louvre), and the celebrated *Diane Chasseresse* for the Château Anet. According to tradition he fell in the St. Bartholomew massacre of 1572. He was a skilful craftsman, keenly alive to all forms of beauty, his figures being remarkable for energy and elegance of line and vivid suggestion of movement. The touch of his chisel was delicate and precise, with a French sharpness of 'accent.'

Goulard's Extract is obtained by dissolving lead acetate in water, adding lead oxide, and boiling the mixture until the sub-acetate is formed. The standard solution contains twenty-four per cent. of the salt. It is a powerful astringent, and is chiefly used in the diluted state.

Goulard's Water is prepared by adding one part of Goulard's extract to eighty parts of recently-boiled distilled water, to which one part of alcohol has been added to expel the carbon dioxide which would give a turbid solution.

Goulburn. (1.) City of New South Wales, Commonwealth of Australia, 134 m. s.w. of Sydney.

It is a Roman Catholic and an Anglican episcopal see. Gold and copper are found in the vicinity. Pop. (1901) 10,618. (2.) River (345 m. long) of Victoria, Australia, rises in the Great Dividing Range in Wonnangatta co., and flows N. and N.W. through the Jamieson and Wood's Point gold fields, and joins the Murray a few miles from Echuca.

Goulburn, EDWARD MEYRICK (1818-97), English divine, born in Chelsea, London; in 1849 succeeded Tait in the headmastership of Rugby, but resigned in 1857. In 1866 he was appointed dean of Norwich. Among his publications are *Life of Dean Burgon* (1892); *Devotional Study of the Holy Scriptures* (10th ed. 1878); *Thoughts on Personal Religion* (14th ed. 1884). He resigned his deanery in 1889.

Gould, BENJAMIN APTHORP (1824-96), born at Boston, Massachusetts, U.S.A.; founded (1849) an *Astronomical Journal*. After being employed on the United States coast survey (1852-67), and being director of the Dudley Observatory at Albany (1855-9), he organized (1870) a national observatory for the Argentine Republic at Cordoba. While in that country (until 1885) he established many meteorological stations, and was one of the first to realize the value of photography in the accurate determination of star places. His *Uranometria Argentina* (1874) and *Catálogo de Zonas Estelares* (1884) are of first-rate importance.

Gould, SIR FRANCIS CARRUTHERS (1844), political caricaturist of the *Westminster Gazette*, born at Barnstable. He was a member of the London Stock Exchange for twenty years, until he drifted into pictorial journalism. His first engagement was on the *Pall Mall Gazette*. The *Westminster Gazette* was started when the *Pall Mall Gazette* was acquired by Mr. Astor, and Mr. Gould went over to the new paper. The parliamentary sketches of 'F.C.G.', with their clever, incisive, sometimes satirical, but always humorous and good-natured representations of political situations and personalities, became one of the chief features of the *Westminster Gazette*. He is both the author and illustrator of, among other works, *Picture Politics*; *The Modern Froissart*, an exceedingly clever commentary on current political events; and *Political Caricatures, 1904* (1904); also of *Who Killed Cock Robin?* (1897), and *Tales Told in the Zoo* (1900). Mr. Henry Lucy's articles in the *Strand Magazine*, 'Behind the Speaker's Chair' (published in book form in 1903), were also illustrated by 'F.C.G.' He was knighted in 1906.

Gould, JAY (1836-92), American financier, the son of a small farmer of Roxbury, Delaware co., New York. After various employments he turned his attention to railway speculation (1870), and eventually controlled the Erie Railway (till 1872), the Union Pacific (1873-83), the Missouri Pacific, the Wabash, the Texas Pacific, the St. Louis and Northern, the St. Louis and San Francisco Railways, the Western Union Telegraph Company (1881), and the elevated railways in New York (1881). He has been called the Napoleon of American finance. He died worth £14,000,000. His son, **GEORGE JAY GOULD** (1858), also controls large railway interests, and in 1892 became president of the Manhattan Elevated Railway of New York. See Ogilvie's *Life and Death of Jay Gould* (1892).

Gould, JOHN (1804-81), English ornithologist, born at Lyme Regis, in Dorsetshire, was appointed (1827) to a post at the Zoological Society, London. With the aid of his wife he brought out *The Century of Birds from the Himalaya Mountains* (1832), and *The Birds of Europe* (1832-7). An arduous journey to the southern hemisphere resulted in his finest work, *The Birds of Australia* (1840-8). Later he published *The Birds of Great Britain* (1862-73), and *Birds of Asia* (1850-80); monographs on the *Rhamphastidae* (1834; 5th ed. 1854), *Trogon* (1838; 2nd ed. 1875), *Odontophorinae* (1844-50), and *Trochilidae*—i.e. Humming Birds (1849-61). See Bowdler Sharpe's *Biographical Memoir of J. Gould* (1893).

Gounod, CHARLES FRANÇOIS (1818-93), French musical composer, born in Paris; won (1839) the Prix de Rome. In Italy he was attracted by the music of Palestrina, and Gounod's first important work was a mass in the master's method; in Germany he studied Bach. The religious element, thus fostered, remained a powerful influence with him for life. The influence of Madame Pauline Viardot secured him a commission to write *Sapho* (for the National Academy), which announced his greatness. His first marked success was in England, where selections from a *Messe Solennelle* were given by Hullah's choir (1851). The year 1859 was marked by *Faust*, which deservedly won world-wide repute. It was first performed at the Théâtre Lyrique, Paris, under Carvalho, with Madame Carvalho as Marguerite. *Philemon and Baucis* and *Mirabelle* followed. In 1867 the Lyrique saw Carvalho as heroine in *Romeo and Juliet*, Gounod's masterpiece. In 1871 the Franco-German war drove

Gounod to England, and during the next five years he appeared at Philharmonic, Crystal Palace, and at Mrs. Welldon's concerts. After *Cinq Mars* (1877) and *Polyeucte* (1878), both inferior operas, Gounod devoted himself to sacred work. *La Rédemption* (1882) and *Mors et Vita* (1885) were received with great favour at Birmingham festivals. Gounod possessed a rare gift of original melody; his orchestration is always masterly, and the peculiar mystic glamour which always pervades his compositions makes much of his music singularly attractive. See *Life*, in English, by Madame de Bovet (1891), and Gounod's *Autobiographical Reminiscences* (1896).

Goura, a genus of large pigeons whose members are found exclusively in Australia. They are the largest of pigeons, and bear a beautiful fan-shaped crest on the head. They seem to spend most of their time on the ground, and are said to be very stupid. An example is the Victorian crowned pigeon (*G. albertisi*). It is greatly valued for the table.

Gourami, or **GURAMI** (*Osphromenus olfax*), a fish belonging to the family Labyrithici, celebrated for its fine flavour. Its original home is the rivers and streams of the East Indian Archipelago. As in the case of its allies, the climbing perch and the fighting fish of Siam, there is an accessory breathing organ enabling the fish to exist for a prolonged period out of water. In the gourami the body is elevated and compressed, and the pelvic fins have their outer ray very long and thread-like. It attains a weight of twenty pounds, and is omnivorous in diet.

Gourd, a name given to various species of the plant genus Cucurbita. All are annual climbing plants, with tendrils, broad leaves, large yellow monœcious flowers, and fleshy fruits. (See PUMPKIN, CUCUMBER, and VEGETABLE MARROW.) In Britain the other gourds are cultivated as curious or ornamental plants rather than for their fruits. Seeds are best sown in a frame in April, and the young plants put in the open air at the beginning of June. The fruits of the several varieties assume the quaintest shapes; thus we have the pear gourd, the orange gourd, the egg gourd, the club gourd, the siphon gourd, the Turk's cap gourd, and the nutmeg gourd. All require a rich, deeply-dug soil and abundance of moisture.

Gourko, JOSEPH VLADIMIROVITCH, COUNT (1828-1901), Russian general, born in Lithuania. In the Russo-Turkish war of 1877 he crossed the Balkans with an army, securing three of the passes, and in July captured

Shipka. In November he captured Orkanie, and isolated Plevna. After the fall of the last-named stronghold, he totally defeated Suleiman Pasha, and captured Sophia, Philippopolis, and Adrianople, when the armistice of January 1878 followed.

Gourock, tn. and wat.-pl., Renfrewshire, Scotland, on s. shore of Firth of Clyde, 3½ m. w. of Greenock. Pop. (1901) 5,244.

Gout is a constitutional disease, characterized by attacks of acute arthritis, by gradual deposition of crystals of urate of sodium around the joints, and by various irregular symptoms displayed in other parts of the body.

Causes.—Amongst the factors of causation are deficiency in the oxidation of food within the body, and diminution in the elimination of waste tissue-products. Other elements in the causation, however, are heredity, sex, age, habits as to food and drink, occupation, and the presence of lead in the tissues. The acute form of the disease is rarely seen in patients under the age of thirty. Most cases occur in those who live luxuriously and indulge freely, though not necessarily to excess, in alcohol. In all cases the blood contains an excess of uric acid.

Symptoms.—When an acute attack of gout is coming on, the patient tends to be wakened in the early morning by an agonizing pain in the ball of the great toe. The joint is red, swollen, and glazed, while the surrounding veins are engorged and tense. The patient's temperature generally rises to 102° or 103°, and the slightest pressure on the affected part causes extreme pain. Towards morning the symptoms subside, and may be absent during the day, but they recur in a slightly subdued form the following night. This lasts six or seven days, but the intensity of the pain gradually abates. There is, however, a tendency to recurrence, and in succeeding attacks other joints generally become affected. The inflammation never ends in suppuration, but with its subsidence the skin over the gouty joint usually desquamates.

The term retrocedent or suppressed gout is applied to a form in which sudden disappearance of the local symptoms is accompanied by the development of serious internal complications, such as pericarditis. Most commonly, however, the symptoms of suppressed gout are displayed in connection with the gastrointestinal tract, where there is another great serous membrane, the peritoneum. Not infrequently a rapid alleviation of gouty symptoms in an inflamed joint coincides with the occur-

rence of abdominal pain, with vomiting, and with diarrhoea so severe that exhaustion and death ensue in a comparatively short time.

As regards chronic gout, with increased frequency in the attacks, the articular symptoms persist longer, and gradually more and more joints are affected. There is a deposit of urates, first in the articular cartilages, and later in and around the ligaments and joint capsules, so that in course of years deformity results from successive 'fits.' As a result of the gouty deposition, extensive concretions of sodium urate are formed about the joints, and often in the lobes of the ears. These are known as tophi, or chalk-stones. The victims of chronic gout are generally dyspeptic, and from changes in the kidneys and heart suffer from increased pulse tension and from arterio-sclerosis. In children born of gouty parents skin diseases of an eczematous type are extremely common, as also are catarrhs of mucous surfaces. It is among adults, however, that the gouty diathesis displays its more serious effects, these being of divers kinds.

Treatment.—In an acute attack the limb should be elevated, and heat should be applied to the affected joint by means of fomentations or by swathings of cotton wool. Free evacuation of the bowels must be procured, a mercurial purge being the most suitable. While pain is present, tincture of colchicum, combined with the citrate of potassium or of lithium, is of great benefit; but with the cessation of the pain the colchicum ought to be discontinued. The diet should consist of milk and barley water, but if the patient be very weak broth and eggs may be added. As the attack subsides, a simple, non-stimulating, ordinary diet should be resumed. In the chronic and irregular forms of gout, colchicum is less serviceable. In some cases sodium salicylate is useful, but must be administered with caution. In others, potassium iodide, guaiacum, bitter tonics with alkalis, relieve the symptoms; and of late years piperazin has been shown to possess a strongly solvent action upon uric acid and its compounds. For the gouty tendency open air exercise, abstinence from alcohol, and moderation in diet are of the first importance. A modified nitrogenous diet should be adopted. Fat, in the form of several ounces of fresh butter daily, is of great service, but salted meats and salt should, as far as possible, be avoided. Mineral waters are all useful to the gouty patient—e.g. those of Bux-

ton and Bath; Carlsbad, Wildbad, and Homburg; and Aix-les-Bains and Contrexéville.

Gouvion St. Cyr, LAURIENT (1764-1830), one of Napoleon's marshals, born at Toul. As a general of division he took part in all the operations of the army of the Rhine, and at the age of thirty-three commanded the army of occupation in Rome. In 1800 he was dispatched as ambassador to Spain. Twelve years later he accompanied Napoleon to Russia. St. Cyr was minister of war in 1815. He wrote *Mémoires pour servir à l'Histoire militaire sous le Directoire, le Consulat, et l'Empire* (1831).

Govan, par. and tn., Lanarkshire and Renfrewshire, Scotland, on l. bk. of the Clyde. Its ship-building yards are among the largest on the Clyde. It has also engineering works, railway locomotive works, and iron works. Its Elder Park was presented to the town by Mrs. J. Elder. Pop. (1901) 82,156.

Govenia, a genus of tropical American orchids which require a warm temperature and a soil composed of fibrous loam and leaf-mould in equal parts.

Government. The general tendency of political development will be found discussed under the article **POLITICS**; the general conception of political association under the article **STATE**. In this article it is proposed to consider in what ways the political authority is exercised. This object nearly, but not entirely, corresponds with the topic which used to be called 'forms of government.'

From the days of Aristotle the world has been familiar with his famous classification of governments into monarchical, aristocratic, and democratic. But practical thinkers have long realized that the classification no longer corresponds with modern developments.

The old picture of the absolute monarch, or *autocrat*, directing the whole of his people's lives by the fiat of his word, has no place in modern politics. Conceivable he may have been in the tiny states of Greece, in which it was possible for a ruler to know every one of his subjects by name. The so-called autocracies of modern Europe, of which the most conspicuous are Russia and Turkey, are really bureaucracies. In such countries nineteen-twentieths of the daily work of government is done by high officials, who, nominally holding their offices at the bare pleasure of the so-called autocrat, are, there can be little doubt, appointed and maintained in office by an elaborate secret system of co-optation. In other

words, government is in the hands of a caste, which is always open to the peculiar claims of class prejudice, selfishness, and corruption, and which must be ranked as the lowest type of government possible in a country with any pretensions to civilization. The close official atmosphere in which its members live renders them peculiarly insusceptible to those popular feelings which must, at times, be either respected or stamped out by force; while the traditions of their profession cause them to regard the community as existing to serve their own purposes rather than to realize its own happiness. In international politics, such a government is, no doubt, a formidable power. It maintains a tenacity, a calculating selfishness, a continuity of policy, an indifference to means, which often prevail for a time against the more humane methods of higher organizations. But, even in external politics, it is apt to fall in the long run, because it does not command the sympathy of its subjects.

The next type of government is that which we may describe as *constitutional*. It arises where a community, which has formerly been ruled by a bureaucracy, has succeeded, without destroying its bureaucracy, in placing legal limitations upon the executive authority. Such limitations usually take the form of a charter, or 'constitution,' granted by the former autocrat. Governments of this type are those of Spain, Austria, Prussia, and the other German states; and the mark of them is, that the executive authority is bound by legal limitations, and by legal limitations only. The head of the state has guaranteed to his subjects certain legal rights; but there is no pretence for saying that, beyond these limitations, the discretionary power of the executive is exercised at the pleasure of the people. The presumption is, that the head of the state may do anything which the constitution has not expressly bound him not to do. Every day we see the federal executive in Germany doing things of which the Reichstag, as a whole, disapproves; and such a state of things is not unknown at Washington.

The third type of government is that which may fairly be called *popular*. It is constitutional government with an additional element of great importance—viz. that the executive, be it king or president, exercises its undoubtedly legal functions according to the wishes of a body which may fairly be said to represent popular or public opinion.

The machinery by which this harmony is achieved is usually that of a cabinet of ministers amenable to a popular chamber, which is itself amenable to a popular electorate. But there is no necessity for this precise form of machinery, as we see in Switzerland.

It is, of course, well known that England, after passing through the stage of constitutional or limited monarchy, which we may reckon from 1215 to 1715, gradually and almost imperceptibly entered upon the stage of popular government, which it is a misnomer to term monarchy. Since its nature has been realized, it has become the great object of the ambition of democratic movements. It has been introduced, at least nominally, in France, Italy, Belgium, Holland, Sweden, Norway, and Greece, and very generally in the great English-speaking colonies in Australia, Canada, and South Africa. Unlike the constitutional type of government, it is rarely formulated in official documents; it depends on custom rather than on express law.

Into one of these three types of government all civilized systems will, it is believed, be found to fall. But there are other principles of government which cut across these, and often distinguish the members of each group *inter se*. One of the most important of these distinctions is that between states which have, and states which have not, entrusted sovereign power to their normal governing authorities. The nature of sovereign power will be found discussed in the article SOVEREIGNTY. In some countries—e.g. the British empire—there exists a normal, regular authority (the crown in Parliament), which claims, and *de facto* exercises, supreme authority, unfettered by any legal restrictions. This is an entirely different thing from having an unfettered executive, as in the bureaucratic type of state. Here the point is that in some countries—e.g. the United States of America, France, and Belgium—there exists no regular constituted authority with unlimited legal powers; and the same holds good of the German empire (as indeed of all federal constitutions), though not of the various German states as regards their international administration. Generally speaking, this state of things can only be brought about by a written constitution. But to this last rule there are important exceptions—e.g. Prussia, where the power of amending the constitution (and thus of breaking it) is expressly confided to the king and the Landtag or Parliament; and Italy, where it seems to be generally agreed

that the *Statuto* does not legally bind the ordinary legislature. To the distinction just explained, Mr. James Bryce has given the happy nomenclature of 'constitutions rigid and flexible.' The sovereign legislature can, of course, alter the form of government, with or without special solemnities. Therefore the constitution under which it works may be termed flexible. The non-sovereign legislature cannot do so, but must resort to the help or submit to the dictation of some external, exceptional body, convened only at rare intervals, and usually with great difficulty. The constitution of which such a legislature forms a part may fairly be called rigid.

Another cross-division of great importance is the distinction between what may be called 'prerogative' and 'common law' states. In the former, and they are by far the most numerous, the acts of the executive, even when they admittedly violate the law, cannot be called in question. To any such proceeding taken against him in respect of such an act, the official pleads superior orders or state necessity. In the common law state, such a plea is simply waived aside, if it is raised in answer to a claim by a citizen. It need hardly be said that the common law character of the state is the proud boast, and almost the exclusive monopoly, of the English-speaking communities. And this is true, in spite of the fact that the term 'prerogative' is fully recognized by English constitutional law, and in spite of the undoubted principle of law that the crown cannot be made personally responsible for wrongful acts by the ordinary tribunals. The *droit administratif* of republican France is quite as genuine a thing as the *Verwaltungsrecht* of monarchical Prussia.

We may now look at a third distinction of principle very marked in modern governments. In some the system is highly *centralized*; in others, it is to a greater or less extent *localized*. By a centralized system of government is meant a system in which all power is really exercised by the authorities residing at the capital of the state, whose jurisdiction extends, of course, to every part of the state's territory. By a localized system of government is meant a system in which a good deal of real power is exercised by local authorities, in and for their own districts only. Great stress should be laid on the expression 'real power,' for in no other case is it more necessary to distinguish between reality and appearance. Thus, if we were to

look merely at forms and names in the systems, let us say, of Prussia and France, we should come to the conclusion that these governments were highly localized. But a careful study of the question shows that the local authorities have very little real power. The appointment of officials by the central government, the careful restriction of financial powers, the right of appeal to the central administration, and other ingenious devices, leave the system of local organization powerless. Nearly all modern civilized states have been produced by the aggregation, voluntary or forcible, of smaller units. Where the struggle for unity has been acute and doubtful, the central government has naturally done its best to extinguish all independent exercise of authority by the absorbed units. Where the union has been effected easily and quickly, and all fear of dissolution has died away, the manifest convenience of local self-government has led the central government to grant liberal measures of local independence. This is the case with England and Scotland. Finally, the aggregation has in some cases been incomplete; and there, of necessity, the central government has had to recognize large independence in the constituent members of the state. This is the case in all federal states, notably in the examples of the American and the Swiss republics. But it also occurs in loosely compacted masses of a non-federal type—e.g. in the Austro-Hungarian empire. See Demombynes's *Les Constitutions Européennes* (2nd ed. 1883); Bryce's *The American Commonwealth* (3rd ed. 1893-5); Lowell's *Governments and Parties in Continental Europe* (1896); Goodnow's *Comparative Administrative Law* (1893); and Dicey's *The Law of the Constitution* (6th ed. 1902).

Governor, COLONIAL. The governor of a British crown colony has real executive power, decreasing generally as the white and English population increases—e.g. the Gold Coast and Trinidad. In the self-governing colonies the governor is little more than a figure-head, although much depends on the man. In Canada the governor of the Dominion is appointed by the crown, and is called governor-general; the governors of the provinces are appointed by the Dominion government, and are styled lieutenant-governors. In Australia, as in Canada, the governor-general of the Commonwealth is appointed by the crown, but the governors of the provinces or states of the Commonwealth are also appointed by the crown.

Governor, a piece of mechanism attached to an engine to enable it to run at a constant speed, by proportioning the amount of energy supplied to the engine to the work that has to be done.

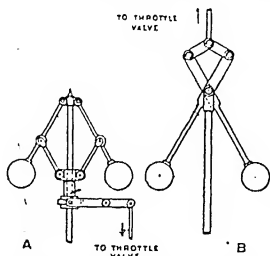


FIG. 1.—Watt's Governor.
A, As commonly used; B, original form.

Even if the load on the engine be constant, variations in the steam pressure (or in the gas or oil supply in the case of a gas or oil engine) still make regulation necessary. In the case of the steam-engine, regulation is effected in one of two ways. The oldest method is that first introduced by Watt, and consists in varying the pressure of the steam supplied to the engine by opening or closing more or less a valve in the supply pipe. This method of regulation is known as 'throttling,' and the regulating valve as the 'throttle valve.' It is still extensively used, especially for small engines. The other method consists in varying the volume of steam supplied to the engine by altering the point of cut-off. The second method, being the more efficient of the two, is chiefly used on large stationary engines. In gas and oil engines, regulation is usually effected by cutting off the gas or oil supply, thus causing the engine to miss one or more explosions whenever the speed rises too high.

Governors are usually of the centrifugal type, of which the pendulum governor of Watt, shown in Fig. 1, may be taken as the simplest. Two heavy balls are fixed at the ends of two links, the other ends of which are pivoted to a vertical spindle, driven from the engine shaft. Owing to centrifugal force, the balls fly outwards, and in doing so raise a sleeve, which slides on the spindle, and is connected with the throttle valve. If the speed of the engine rises above its normal, the balls fly farther out and the sleeve is raised, closing the throttle valve a little, and reducing the pressure of the steam supplied to the engine. When the speed falls, the balls move inwards, and the throttle valve is opened a little, increasing the

pressure of steam supplied to the engine. In the figure the arms are shown jointed to the spindle; but they are sometimes pivoted to a short cross-bar rigidly attached to the spindle, as shown diagrammatically in Fig. 4, or as in Fig. 5, where the arms are crossed, the spindle being slotted out to allow them to pass through.

Fig. 2 shows a modification of Watt's governor, the original form being now seldom used. It is known as the 'loaded Watt governor,' or the 'Porter governor,' after its inventor. As will be seen from the figure, there is a large central weight resting on the sleeve, and sliding with it on the spindle. Loading a governor in this manner gives it more power to overcome frictional resistances than an unloaded governor with revolving balls of the same weight. The speed of revolution of a loaded governor is much higher than that of an unloaded one. In some similar forms of governor the central weight is replaced by a spring. Such governors are often spoken of as 'spring controlled.'

Fig. 3 shows a Hartnell governor. In this the balls are fixed to the ends of two bell-crank levers, pivoted to a frame fixed on the governor spindle and rotating with it. The other ends of the bell-cranks rest on a collar sliding on the governor spindle, and held down by a spring. By alter-

off valve. The valve spindle L receives its motion from a block in the link N, which is made to

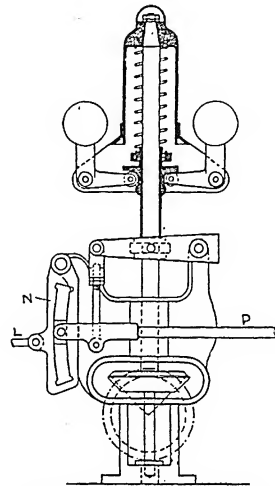


FIG. 3.—Hartnell Governor.

oscillate to and fro by an eccentric, P being the eccentric rod. The position of the block in the link is determined by the governor, a high position giving an early cut-off, a low position a late one.

Equilibrium of Pendulum Governor. Neglecting the weight of the arms and sliding sleeve, the unloaded Watt governor is equiv-

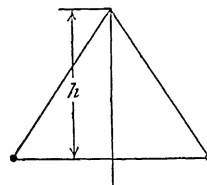


FIG. 4.

alent to a simple conical pendulum, the height of revolution (h in Figs. 4, 5, and 6) of which is given by—

$$h = \frac{g}{4\pi^2 n^2}, \text{ or } n = \frac{1}{2\pi} \sqrt{\frac{g}{h}},$$

where n is the number of revolu-

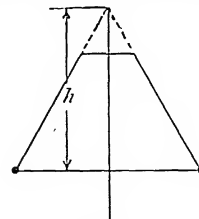


FIG. 5.

tions per second, and h is measured in feet. See PENDULUM.

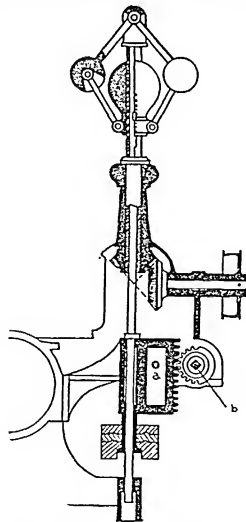


FIG. 2.—Porter Governor.

ing the initial tension of the spring, the sensitiveness may be increased or diminished. This governor regulates by altering the point of cut-off, which is done by varying the stroke of the cut-

For stability, the height h must diminish as n increases. This is obviously the case in the forms shown in Figs. 4 and 5. By suitably proportioning the cross-bar in Fig. 6, the height h may be made nearly constant: a slight variation in speed will produce a large displacement of the balls. If the centres of suspension be placed farther apart, h increases as n increases, and the governor becomes unstable, the balls flying at once to the extreme position.

Equilibrium of Loaded Governor.—In the loaded governor the four links are usually made equal to one another, so that the vertical displacement of the balls is half that of the central weight. The effect of this arrangement is equivalent to increasing the weight of each ball by an amount equal to that of the central weight; while its mass, and therefore its centrifugal force, remain the same.

If w lbs. be the weight of each ball, w lbs. the weight of the central weight, and n the number of revolutions per second, then

$$oN = h = \frac{w + w}{w} \cdot \frac{g}{4\pi^2 n^2},$$

$$n = \frac{1}{2\pi} \sqrt{\frac{g}{h} \cdot \frac{w + w}{w}},$$

i.e. for a given height of revolution (h), the speed must be higher than that of the unloaded governor in the ratio $\sqrt{w + w} : \sqrt{w}$.

Effect of Friction.—The friction of the governor and the valve mechanism may be considered as a force F , added to the central weight when the governor is on the point of moving up, and subtracted when it is on the point of moving down. Then if n_1 and n_2 be the corresponding limits of speed,

$$n_1 = \frac{1}{2\pi} \sqrt{\frac{g}{h} \cdot \frac{w + w + F}{w}},$$

$$n_2 = \frac{1}{2\pi} \sqrt{\frac{g}{h} \cdot \frac{w + w - F}{w}},$$

$$\therefore n_1 - n_2 = \frac{1}{2\pi} \sqrt{\frac{g}{wh}} \times$$

$$\{\sqrt{w + w + F} - \sqrt{w + w - F}\}.$$

$$\therefore \frac{n_1 - n_2}{n}$$

$$= \frac{\sqrt{w + w + F} - \sqrt{w + w - F}}{\sqrt{w + w}}$$

$$= \sqrt{1 + \frac{F}{w + w}} - \sqrt{1 - \frac{F}{w + w}}$$

$$= \frac{F}{w + w} \text{ approx.,}$$

since in practice F is small compared with $w + w$.

The above expression gives us the variation in speed (expressed as a fraction of the mean speed) due to friction, and shows us that in order that the governor may be powerful—i.e. able to overcome a large frictional resistance—the controlling force $w + w$ must be large. By making the central weight large, power may be secured while keeping the revolving weights small. The above expression holds if the controlling force of the central weight be replaced by a spring.

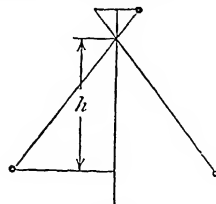


FIG. 6.

Sensitivity and Isochronism.—If there were no friction, only one position of the governor balls would be possible for any particular speed; and since the steam supply depends upon the position of the balls, the speed of the engine must vary for different loads. When the variation of speed allowed by the governor between no load and full load is small, the governor is said to be 'sensitive.'

Apart from friction, it would be possible to make a governor in which only one speed was possible, the slightest variation from the given speed sending the balls into the extreme up or down position. Such a governor would be called 'isochronous.' Friction prevents the attainment of isochronism, and also in practice a certain amount of stability is necessary in order to counteract the tendency to oscillate violently up and down whenever the speed changes from the normal.

The governor shown diagrammatically in Fig. 6 may be made isochronous for small displacements by suitably proportioning the cross-bar from which the arms are hung. In practice it is made rather shorter than this in order to give the necessary stability. This arrangement is known as Farcot's governor, from its inventor.

Hunting.—When an engine changes its speed there is always an interval of 'lag' before the governor produces its effect, due partly to the governor not responding instantly to the change of speed of the engine, and partly to the response of the governor not producing an immediate effect on the engine; for the steam already in the engine will

continue to do its work, and if cut-off has occurred, it is not till the next stroke that the action of the governor can begin to take effect. In compound engines in particular, the steam, after passing through the high-pressure cylinder, passes into the low-pressure cylinder, continuing to do work for almost a revolution before the action of the governor can take full effect. The result is that if the governor be too sensitive, a sudden decrease of the load on the engine may increase the speed considerably before the action of the governor makes itself felt; and in consequence the governor moves too far, and reduces the steam supply below what is necessary for the diminished load. This causes the speed to be diminished too much, and the same effect is produced in the opposite direction. The oscillation which thus tends to be set up is known as 'hunting.' Hunting is increased by the friction of the governor and accompanying mechanism, and to a less extent by the momentum acquired by the governor balls in changing their position. To prevent hunting, the governor should have a fair margin of stability, and the friction of the regulating mechanism should be as small as possible. Also the weights of those portions of the regulating mechanism which have to be moved by the governor should be small, so that they will move readily. Hunting may also be prevented by interposing a fluid resistance, such as a dash-pot, which prevents a sudden movement of the governor without affecting its final position.

Shaft Governors.—The governors of high-speed engines are sometimes fixed directly to the crank-shaft of the engine, often within the fly-wheel, the arms of which serve as centres for the revolving weights. The centrifugal force of the revolving weights is controlled by springs. Governors of this type often regulate by varying the cut-off, by altering the angle of advance and the throw of the eccentric.

In large stationary engines the governor often controls the cut-off through the medium of some form of trip gear, as in the well-known Corliss gear. In trip gears the admission valves close suddenly by means of springs, and the governor regulates the point of cut-off by determining the instant when the 'trip' acts.

Hydraulic or Pump Governors.—In this type of governor a small pump driven from the engine pumps water into a small cylinder with a piston held down by a spring, the piston being connected with the regulating mechanism. The water escapes from

the vessel by an orifice, the size of which is so regulated that at normal speed the pressure is just sufficient to support the piston against the pressure of the spring. If the speed rises, the pressure in the cylinder is increased and the piston is raised, reducing the steam supply.

Gow, ANDREW CARRICK (1848), English artist, born in London. Beginning to exhibit at the Royal Academy in 1869, he became A.R.A. (1881), and R.A. (1891). He is a deft painter of costume subjects, warlike and historical. His principal pictures are:—*Relief of Leyden* (1876), *No Surrender* (1878), *Last Days of Edward VI.* (1880), *Cromwell at Dunbar* (purchased by the Chantry Bequest, 1886), *After Waterloo* (1890), *Queen Mary's Farewell to Scotland* (1892), *Waiting for Prince Charlie* (1897), and *The Flight of James II. after the Battle of the Boyne* (1888), in the Tate Gallery, London.

Gow, NATHANIEL (1766-1831), Scottish violinist and musical composer, son of Niel Gow, was born at Inver in Perthshire. He made a large fortune by playing at balls and conducting concerts, which he afterwards lost, and became a famous teacher. His son, Niel Gow the second (d. 1823), composed the song *Bonnie Prince Charlie*.

Gow, NIEL (1727-1807), Scottish violinist and composer, was born at Inver, Perthshire. He was famous for his bow-stroke, and was reputed to be the finest player of dance music Great Britain has produced.

Gower, or GWR, peninsula of Glamorganshire, S. Wales, projecting into the Bristol Channel between Burry Inlet and Swansea Bay. Length, 15 m.; average breadth, 5 m. There are so-called Druidical remains. Castles and churches erected by the Normans of the 11th century still remain. The present inhabitants still betray their descent from the colony of Flemings planted in the peninsula by Henry I.

Gower, JOHN (?1332-1408), English poet, was born of a family that owned land in Suffolk and Kent, and himself lived for at least some time at Otford in the latter county. In 1390 (about which time he probably married), he describes himself as old and of infirm health; and ten years later he lost the use of his eyesight. His will is dated August 1408, and in the latter part of that year he died, and was buried in St. Mary Overies—now St. Saviour's—Southwark, where his tomb is still preserved. Gower's literary productions consist of three long poems—viz. the *Speculum Meditantis* (originally styled *Speculum Hominis*), writ-

ten in French about 1378, and long given up for lost, until recently discovered by Mr. G. C. Macaulay; the *Vox Clamantis*, written in Latin elegiacs about 1382; and the *Confessio Amantis* (c. 1390), written in English octosyllabic verse. The last named is the work on which the poet's reputation chiefly rests. Gower also wrote fifty French ballads, assigned to his latest period. The relations between Gower and Chaucer have been the subject of some discussion. In his *Troilus and Cressida* Chaucer refers to 'the moral Gower,' and nominated him as joint-trustee during one of his absences from England. Later, however, in the introduction to the *Man of Law's Tale*, he exclaims against certain classes of tales, and gives as examples the stories of Canace and of Apollonius of Tyre, which are both to be found in the *Confessio*. Gower, on his part, in the *Confessio* makes Venus greet Chaucer as her 'disciple and poete,' and enjoins him to write a testament of love; but in later editions of the poem the passage is omitted. These facts have been supposed, perhaps wrongly, to point to a personal or artistic estrangement between the poets. Gower's work is rarely inspired, and the extreme technical perfection of his verse, with its unvarying caesura, seems monotonous to modern ears. The influence he exerted on English literature up to the age of Shakespeare is second only to that of Chaucer. The *Vox Clamantis* may be studied in Cox's edition (Roxburghe Club, 1850), the *Confessio* in the edition of Dr. R. Pauli (1857) or that of Henry Morley (Carisbrooke Library, 1889). The last and only satisfactory edition is Mr. G. C. Macaulay's *Works of John Gower—French and English Works* (3 vols. 1901).

Gown, the long robe worn by women. In the 14th century gowns were common to both sexes alike. Men continued to wear the garment until the end of the 17th century. Gowns, often indicating by their colour the rank of a student, were retained by the universities as a badge, after the general mass of the people had ceased to wear such garments. After the reformation, clerics who were not university graduates, and for greater distinction from Roman Catholic priests, adopted the black Geneva gown, still worn in Scottish churches. The custom obtained in the Anglican Church of wearing a surplice during the reading of prayers, and in 1840 a controversy, which was never definitively settled, raged about this. Except in Scotland, the academic gowns of undergraduates are

black, while the material, cut, and colour of academic gowns generally often indicate faculty, degree, or university.

Gowreeshankar, VODEY-SHANKAR (1805-92), Indian native administrator and diplomatist, born at Gogo, on the E. side of the Kathiawar peninsula. His work was prosecuted from 1847 in the Bhaunagar state, Kathiawar, which assumed the lead among the other peninsular states in the material development of their resources. He retired in 1879.

Gowrie. See CARSE OF GOWRIE.

Gowrie Conspiracy. On Aug. 5, 1600, John, third Earl of Gowrie, and his brother, Alexander, the Master of Ruthven, were slain in their house in Perth, by some of the retinue of James VI. of Scotland, the king being present. Their deaths occurred thus. At about half-past 6 a.m. on August 5 Ruthven appeared at Falkland, having left Perth about 4 a.m. He had a conversation with the king, who followed the chase till about eleven, and then rode with Ruthven to Perth, accompanied by Lennox, Mar, three Erskines, and others, his whole suite being some twenty-five men. After dinner James and Ruthven left the company. A retainer of Gowrie brought a report that the king had ridden away alone. Gowrie called, 'To horse,' and insisted, after entering the house to inquire, that the king had really gone. Later a turret window was thrown open, and James cried, 'Treason!' The nobles rushed upstairs to his rescue, but were stopped by a locked door. Gowrie was detained in the street by Sir Thomas Erskine and others. John Ramsay entered the house by a back stair, forced his way into a chamber on the first floor, and found the king struggling with the Master of Ruthven. A man was looking on; he disappeared. Ramsay dirked Ruthven, who was thrown down the back stair, and killed by Erskine and two others, to whom Ramsay had called. Gowrie then came up the back stairs with several followers, and a fight began. Ramsay slew Gowrie; his followers fled, and there was a tumult in the town, of which Gowrie was provost. The king's tale was that Ruthven lured him to Perth with a story of a captive and a pot of gold. This James told Lennox during the ride. He said that he went with Ruthven after dinner to see the gold, but found only an armed man, who merely trembled. Ruthven threatened him with the man's dagger, then was mollified, went to bring Gowrie, returned alone and said the king must die, but

merely tried to bind his hands. The other man opened the window, James shouted, and the rest followed. There could be no other corroboration of the king's version, and it was disbelieved by the preachers and their flocks, Gowrie having been their favourite. Eight years later, one Sprot, notary to a famous ruffian—Logan of Restalrig (d. July 1606)—was found to possess letters as to the plot, including one from Logan to Gowrie. He employed these as means of blackmailing Logan's heirs. All these letters but that one were confessed by Sprot to be forgeries by himself, and all are forgeries. There is reason to surmise that for the letter to Gowrie Sprot had a genuine model. He remained constant to his confession of a plot to which he had been privy, and Logan, though not in debt, had sold all his lands after 1600, probably to avoid forfeiture in case of detection. Sprot was hanged (Aug. 12, 1608). That the king contrived the whole set of perilous situations is denounced by Hill Burton as 'not a sane conclusion.' Sir Walter Scott was of the same opinion. If the Ruthvens had a plot, it was to kidnap the person of the king, and change the administration in the interests of the kirk. For the theory of the Ruthvens's guilt, see Tytler's and Hill Burton's *Histories of Scotland*, and Lang's *James VI. and the Gowrie Mystery* (1902), with several previously unpublished documents; also his *Confessions of Sprot* (Roxburghe Club, 1902). For the best defence of the Ruthvens, see *The Tragedy of Gowrie House*, by Louis Barbé (1887). For the best collection of evidence and documents, see Pitcairn's *Scottish Criminal Trials* (vol. ii. 1833).

Goya, tn., Corrientes, Argentine Republic, 100 m. S. of Corrientes. Pop. about 6,000.

Goyana, or GOYANNA, tn., Brazil, on Goyana R., 40 m. N.W. of Pernambuco; has sugar plantations and a trade in cotton and dyewood. Pop. about 10,000.

Goya y Lucientes, FRANCISCO JOSÉ DE (1746–1828), Spanish painter, born at Fuendetodos, near Saragossa. A man of vigorous temperament and stormy passions, Goya associated himself with the quarrels of the painters and confraternities; and in consequence of a street brawl he fled from Madrid to Italy with a band of bull-fighters. In Rome he became the friend of the French painter Louis David, whose hard style he affected in his sacred pictures. Returning to Spain (1774), he attracted the notice of Mengs, the king's painter, who assisted him to win patronage as a portrait painter. He was

appointed painter-in-ordinary to Charles IV. and to his successor, Ferdinand VII. (1789). Among his sitters was the Duke of Wellington. Goya died at Bordeaux, where he spent his last years. His genius does not find expression in his sacred paintings, which are feeble and coarse, but in his keenly characterized portraits, and still more in his paintings, sketches, drawings, and etchings of bull-fights, of street-fights, and his satirical studies of society and the church. The British Museum has a fine collection of his etchings and aquatints; in the National Gallery, London, are *The Picnic*, *The Bewitched*, and a *Portrait*, admirably representative of his three best styles. See W. Rothenstein's *Goya* (1900) and Yriarte's *Goya* (1897).

Goyaz. (1.) State of Brazil between Minas Geraes and Matto Grosso. The country is mountainous, being traversed by several well-wooded ranges. Agriculture and cattle-grazing are the chief occupations of the inhabitants (mostly half-castes and Indians). Area, 288,470 sq. m. Pop. 200,000 to 250,000. (2.) VILLA BOA DE GOYAZ, cap. of the state of Goyaz in Brazil, formerly called Villa Boa; is situated in the valley of the Araguaya. It is a centre for the cattle, wine, and tobacco industries, and contains a cathedral. Pop. 10,000.

Gozan (*Gauzanitis*), the Gyzan of the cuneiform inscriptions, the Mygdonius of the Greeks, and the Hermas of Arabic writers, a river of Mesopotamia, and a tributary of the Euphrates through the Khabor (Chaboras). It was to this region that the children of Israel were deported after the capture of Samaria in 722 B.C. (2 Kings 18:11 and 1 Chr. 5:26). The principal town of the district was Nisibis, and the district formed part subsequently of Osroene.

Gozo (anc. *Gaulos*), British isl., Mediterranean Sea, 4 m. N.W. of Malta. Area, nearly 25 sq. m. It possesses cyclopean walls of unknown origin, and Roman monuments. The chief town, Rabato, in the centre of the island, has a population of about 25,000. The women make lace.

Gozzi, COUNT CARLO (1720–1806), Italian dramatist, born at Venice, brother of Gasparo; took a prominent part in the opposition to Goldoni, when the latter attempted to substitute upon the Italian stage finished comedies for the ancient Italian *Commedia dell'Arte*. In this campaign Gozzi made use of the satirical wit for which he was famous in Venice, and which is prominent in his poem *Tartana degli Influssi per l'Anno Bisestile* (1757), directed against the inno-

vator. A series of 'dramatic fairy tales' from the pen of Gozzi find their best example in *Turandot*, *Princess of China* (Eng. trans., Calaf, 1826), which was translated by Schiller. He also devoted himself to the production of comedies after the style of Calderon. A complete edition of his works appeared at Venice (1802). See his *Memorie Inutili* (1797; Eng. trans. by J. A. Symonds, 1889); also works by Magrini (2nd ed. 1883), and Carrara's *Studio sul Teatro Italiano-Veneto di Carlo Gozzi* (1901).

Gozzi, COUNT GASPARO (1713–86), Italian poet and essayist, born at Venice, brother of Carlo; edited the journals *Gazzetta Veneta* (1760) and *Osservatore Veneto* (1761)—the latter modelled upon the English *Spectator*—and gained a high reputation as a writer of pure, classical Italian. After acting as superintendent and censor to the Venetian press, he spent his later years at Padua. The *Osservatore Veneto*, which was almost entirely from his own pen, has been republished at Turin (1889). Among his other works are *Il Mondo Morale* (1760), a collection of short papers; *Lettere Famigliari* (1755 and 1808). Among his poems the Horatian *Sermoni* and *Il Trionfo dell'Umiltà* are the most notable. A collected edition of his works appeared at Venice in 1794–8, and another in 1812. See *Lives*, in Italian, by Malmiquati (1889) and Vimercati (1887).

Gozzoli, BENOZZO (1420–98), Italian painter, pupil of Fra Angelico, was born at Florence, and is best known as a fresco painter, though he also assisted Ghiberti in bronze work. About 1464 he painted the immense frescoes in the Church of S. Agostino at San Gimignano (1464–7). His greatest work, the vast series of frescoes in the Campo Santo at Pisa, consisting of twenty-four scenes from Old Testament history, took him and his assistants sixteen years to complete. He also painted some fine frescoes in the Palazzo Riccardi, Florence. Gozzoli was endowed with a prolific fancy and an amazing power of work.

G.P.O., General Post Office.

Graaf, REGNIER DE (1641–73), Dutch physician and anatomist, born at Shoonhoven. After graduating he resided at Delft. At an early age he became widely known through his Latin *Treatise on the Nature and Use of the Pancreas* (1663). In 1672 he discovered the follicles of the ovaries, which have since been known by his name. Among his works may be mentioned *Tractatus de Virorum Organibus* (1668); *Tractatus de Mulierum Organibus* (1672). His *Opera Omnia* appeared in 1677.

Graaf Reinet, tn., Cape Colony, one of the oldest settlements (founded about 1780) of the Dutch East India Company; is called the 'City of the Karroo.' Pop. 5,913.

Grabbe, CHRISTIAN DIETRICH (1801-36), German dramatist, was born at Detmold; led a Bohemian life, and made unsuccessful dramatic attempts. The most important of his dramas are *Don Juan und Faust* (1829), *Napoleon* (1831), *Hannibal* (1835), *Die Hermannsschlacht* (1838). There is a painful straining after realism and after effect, which counterbalances his undoubted force of imagination and his inspired glimpses of human nature. Grabbe's works were edited by O. Blumenthal (4 vols. 1874), and a selection by F. Bobertag (*Kürschners Deutsche National-Literatur*, No. 161).

Grabow, former industrial suburb of Stettin, Germany, now incorporated with Stettin.

Grabowskia, a genus of S. American shrubs belonging to the order Solanaceæ. They are mostly grown in sheltered situations in the warmer parts of Britain in the open.

Gracchus, Roman family of the plebeian Sempronian clan. (1.)

TIBERIUS SEMPRONIUS GRACCHUS, consul in 215 B.C. He fought against the Carthaginians in the second Punic war; in 212 he fell in battle against Mago.

(2.) **TIBERIUS SEMPRONIUS GRACCHUS**, father of the tribunes, was born about 210 B.C. He married Cornelia, daughter of Scipio Africanus. In 181 he was prætor, and governed the province of Spain for two years. He defeated the rebels in the field, and when they submitted, treated them with such justice and moderation that the province was at rest for nearly thirty years after. In 177 he was consul, and suppressed a revolt in Sardinia; he was censor in 169, and consul again in 163. (3.) **TIBERIUS SEMPRONIUS GRACCHUS** (c. 167-133 B.C.), the elder son of the above. He and his brother Caius were carefully educated by their mother, Cornelia. In 137 B.C. he served as questor under Mancinus in Spain, and was elected tribune for 133 B.C. He at once attempted agrarian reform. The aim of his legislation was simply to redistribute the lands occupied by the nobles beyond what was allowed by the Licinian law. It was in no sense a measure of confiscation, for it did not touch private property. The land thus reclaimed was to be allotted to poor citizens in small farms, not in freehold, but as heritable and inalienable leaseholds. The law was passed, but the young nobles, headed

by Scipio Nasica, rushed into the Forum and killed Gracchus, with three hundred of his supporters. (4.) **CAIUS SEMPRONIUS GRACCHUS** (158-121 B.C.) was nine years younger than his brother Tiberius. In 126 and 125 B.C. he served as questor in Sardinia. He was elected tribune for 123, and re-elected for 122. He re-enacted his brother's agrarian law; he proposed to found several colonies, particularly at Carthage and Corinth; he arranged that corn should be sold to the populace at a moderate price; he caused the juries in public cases to be chosen from men possessed of the equestrian census instead of from senators, thus creating the order of knights as a counterpoise to the senate, and for their benefit caused the right of collecting the taxes of the province of Asia to be sold by auction in Rome; he enacted that provinces should be assigned to magistrates before their election, thus depriving the senate of the power of arranging the provincial governments; and re-enacted the law of appeal, which declared the indefeasible right of the Roman people to try capital cases, and indirectly condemned the senate for the murder of his brother Tiberius and his partisans. But he began to alienate popular support by proposing to give the Roman franchise to the Latins, and the senate outbid him with the people by getting another of the tribunes, Livius Drusus, to pass laws which remitted the rent paid by the holders of allotments under the legislation of Tiberius Gracchus; proposed the foundation of twelve colonies in Italy; and forbade the flogging of Latin soldiers by Roman officers. These laws were carried while Caius was absent in Africa superintending the foundation of the colony Junonia at Carthage. On his return he found his popularity gone, and he failed to be re-elected to the tribunate. Thereupon a riot arose, and Caius was driven to cast himself on the sword of one of his slaves. Personally, Caius was of as high a character as his brother, but more fiery and vehement; and he was a magnificent orator. See Beesly's *Gracchi* (1876); C. W. C. Oman's *Seven Roman Statesmen: the Gracchi* (1902); and Callegari's *La Legislazione Sociale di Cajo Gracco* (1896), and *I Gracchi e l'Opera loro Politico-Sociale* (1898).

Grace, as a theological term, may be defined as the divine love in its special relationship to fallen mankind—i.e. the free and unearned favour of God toward sinners. This peculiar theological usage of the term 'grace' seems to have originated with Paul,

who contrasts it with debt (Rom. 4:4), and with works (Rom. 11:6)—his contention being that, if salvation could be won by the fulfilment of obligation, then men could claim it as the just payment of what was due, and there would be no 'grace' in the matter. The correlative idea is faith: 'By [God's] grace are ye saved through [your] faith' (Eph. 2:8). As grace is thus the Godward side of election, justification, and sanctification, it provides theology with one of its most vexed problems—viz. to assign accurately to God and man their respective parts in the work of redemption. Pelagius held that the free human will was only assisted by the divine grace, while Augustine regarded the latter as the sole source and ground of salvation. Roman Catholics generally accept the doctrine of *synergism*, the co-operation of grace and free will (semi-Pelagianism); while Protestantism rather intensifies the Augustinian view, by the theory of a preparatory and prevenient grace as the prior condition to every good purpose in man. See Sanday's *Romans* (1883), p. 10 f.; Doerner's *System of Christian Doctrine* (1886), iv.

Grace, WILLIAM GILBERT (1848), English cricketer, was born at Downend, Gloucestershire. In the first great match in which he took part he played for South Wales at the Kennington Oval (1864), and immediately afterwards made 170 at Brighton against the Gentlemen of Sussex. In 1868 he scored 100 twice in one match—an achievement that he has since repeated on three occasions. Engaged in first-class cricket for over forty years, he has fairly earned the title of 'champion.' His highest score of 400 not out was made against twenty-two of Grimsby (1876); his highest score in first-class cricket is 344. His highest annual aggregate of runs is 2,739, scored in 1871; in 1875 he took 192 wickets in a season. Playing against Oxford in 1886, he took all the wickets in one innings for 49 runs. Since 1899 he has been secretary and general manager of the London County Cricket Club. By profession he is a doctor, and resides at Sydenham. See his *Cricketing Reminiscences* (1899).

Gracedieu, vil., Leicestershire, England, 5 m. N.E. of Ashby-de-la-Zouch; has ruins of a 13th-century abbey. Beaumont, the Elizabethan dramatist, was born in the manor house in 1584.

Graces. See CHARITIES.
Gracia, tn., prov. Barcelona, Spain, 3 m. N.W. of Barcelona; is almost a residential suburb of the city; manufactures cottons and linens. Pop. (1900) 50,000.

Gracian, BALTASAR (c. 1600-58), Spanish prose writer, was born at Calatayud in Aragon. His principal book, *El Criticon* (1650-64), is a philosophical allegory of life. Its tone is bitter and pessimistic, but full of ingenious similes and keen wit. An earlier work, *Agudeza y Arte de Injénio* (1642), is a manual of style and rhetoric.

Graciosa. See AZORES.

Gradient, the rate of inclination from the horizontal of railways and roads, usually expressed in terms of the length traversed to gain or lose one foot in height. The ruling gradient of a railway is the steepest rate of inclination which prevails generally over its course. This



W. G. Grace.
(Photo by E. Hawkins & Co.)

Gracian's prose is marred by the affectation of imagery introduced by Gongora. A good edition of all his works was published at Antwerp (1669), and his *Oraculo Manual y Arte de Prudencia* has been translated by Mr. Joseph Jacobs—*The Art of Worldly Wisdom* (1892). See Borinski's *Baltasar Gracian und die Hofliteratur in Deutschland* (1894).

is determined by the character of the country to be traversed, and by the economy to be observed during construction. The flatter the gradient the less will be the expense of working the railway, and the greater the facilities for running heavy trains at a high speed; while at the same time the cost of construction is liable to increase in an equal

ratio. The Great Central extension to London has a ruling gradient of 1 in 176, and this may be taken as a fair standard for trunk lines. On less important railways gradients of 1 in 100, or less, may with advantage be adopted; while some modern lines in mountainous countries have been constructed at as steep an inclination as 1 in 25. A modern highway should have no steeper gradient than 1 in 30, but this is frequently exceeded in older roads, and an inclination of 1 in 12 is not uncommon on less frequented ways.

Gradijsk, tn., Poltava gov., S. Russia, 20 m. N.W. of Kremenchug. Pop. (1897) 9,496.

Grading and Conditioning. In 'conditioning houses' the officials measure the moisture, dry samples, and declare the weight before and after, number the counts, measure the tissues and the effects of scouring, and say what quantity of chemicals or other admixtures fabrics contain. The relative thickness, etc., of silk and other textile materials is expressed by numbers, showing either the weight of the yarn per given length, or the length per given weight. The international congress on matters connected with the silk trade, held in 1873 and 1874, resolved that 'the grade of silk ought to be expressed by ten times the number of grammes given by a hank of 1,000 metres.' But the grade is still expressed in different ways in different countries. In England, in the case of spun silk, it is expressed by the number of skeins, of 840 yards each, that weigh a pound.

Gradisca. See GÖRZ.

Grado, anc. tn. and modern sea-bathing resort and fishing-station, prov. Görz and Gradisca, Austria, at the N. extremity of the Adriatic, 20 m. W. of Trieste. In the 6th and 7th centuries it was the residence of the patriarch of Aquileia, and from 717 to 1451 was itself the seat of a patriarch. Pop. (1900) 3,964.

Gradual, a kind of short anthem sung at high mass after the epistle. The words of the gradual are usually taken from the Psalms, and its use dates from about the 5th century. The name is also given to collections of this class of composition.

Gradual Psalms, 'songs of ascents' or 'songs of degrees,' a group of fifteen short but exquisite lyrics in the Hebrew Psalter (Ps. 120-134). The term has been supposed to refer to the fifteen steps on the temple between the men's court and the women's (the Talmud); to a certain ascending development in literary structure (Delitzsch); to the return from the exile (Ewald); or to the pilgrimages to Jerusalem

(Robertson Smith and most recent critics). See Commentaries on Psalms—e.g. Ewald (1880-1) and Delitzsch (1887), both translated.

Graduation. See SCALE.

Gradus ad Parnassum ('Steps to Parnassus'), a dictionary of Latin prosody, giving the quantities of words, and suggesting synonyms, poetical phrases, and epithets. The most famous gradus is one by Paul Aler, a Jesuit of Luxemburg, published about 1702.

Graetz, HEINRICH. See GRÄTZ.
Graevius, JOHANN GEORG. See GRÄVIUS.

Graf, or GRAFF, ANTON (1736-1813), Swiss painter, born at Winterthur; made his reputation as a portrait painter in Munich. He was elected court painter to the king of Saxony. Called the Van Dyck of Germany, he painted more than 1,600 portraits, and among his sitters were Mendelssohn, Gellert, etc. He also painted good landscapes of the Rhineland and Switzerland.—His son, **KARL ANTON** (1774-1832), also painted admirable landscapes full of delicate colour and mystic suggestiveness.

Graf, ARTURO (1848), Italian scholar and poet, of German descent, born at Athens; in 1874 became lecturer at Rome, and in 1882 professor of Italian literature at Turin. He was for a time joint-editor of the *Giornale Storico della Letteratura Italiana* (1883, etc.). His poems have appeared under the titles *Versi* (1874), *Poesie e Novelle* (1876), *Medusa* (1880; 3rd ed. 1890), *Dopo il Tramonto* (1893), *Le Danairi* (1897), and *Morgana* (1901). He has published in prose *Dell' Epica Neo-Latina* (1876); *Delle Origini del Dramma Moderno* (1876); *Studi Drammatici* (1878); *Roma nella Memoria e nelle Immaginazioni del Medio Evo* (1882-3); *Miti, Leggende e Superstizioni del Medio Evo* (1892-3). As a poet his thought is sombre, but his diction forcible.

Graf, KARL HEINRICH (1801-69), German theologian, born at Mülhausen in Alsace. He was appointed professor of theology at Leipzig, and taught that the main portion of the Pentateuch dates from after the exile. These views he maintained in his *Geschichtliche Bücher des Alten Testaments* (1866), and in an epoch-making paper in Merx's *Archiv für Erforschung des Alten Testaments* (1869).

Gräfe, ALBRECHT VON (1828-70), German oculist and physician, son of Karl Ferdinand; born at Berlin, and founded there (1850) a private institution for the cure of ocular disease, in connection with which he successfully combated glaucoma, before regarded as incurable,

and developed an improved method of operating for cataract. An authority upon diseases of the brain and nervous system, he was the first to diagnose their state from their morbid effect upon the eye. He was one of the editors of the *Archiv für Ophthalmologie*. See *Life* by Michaelis (1877); also *A. von Gräfe's Verdienste um die neue Ophthalmologie*, by Jacobson (1885).

Gräfe, KARL FERDINAND VON (1787-1840), German surgeon, a native of Warsaw; in 1811 became professor of surgery at Berlin. During the war with Napoleon, Von Gräfe was placed in charge of the military hospitals, but after Waterloo resumed his professorship. In addition to this he was appointed chief of the army medical staff. His fame rests on his improvements in methods of surgical operation, and on the invention of better appliances. Von Gräfe wrote *Normen für die Ablösung grosser Gliedmassen* (1812); *Rhinoplastik* (1813); *Neue Beiträge zur Kunst Teile des Angesichts organisch zu ersetzen* (1821). See *Life* by Michaelis.

Gräfenberg, vil. and health resort, Silesia, Austria-Hungary, in the Sudetic Mts., near Friedwaldau. The first hydropathic establishment was formed here by Priessnitz in 1826.

Graff, EBERHARD GOTTLIEB (1780-1841), German philologist, was born at Elbing in E. Prussia, and was appointed professor of German language and literature at Königsberg (1824). His speciality was the old German language, and the results of his labours were published in *Diutiska, Denkmäler Deutscher Sprache und Literatur aus alten Handschriften* (3 vols. 1826-9), *Otfried's Evangelienharmonie* (1831), and *Althochdeutscher Sprachschatz* (6 vols. 1835-43).

Graffiti. See INSCRIPTIONS.

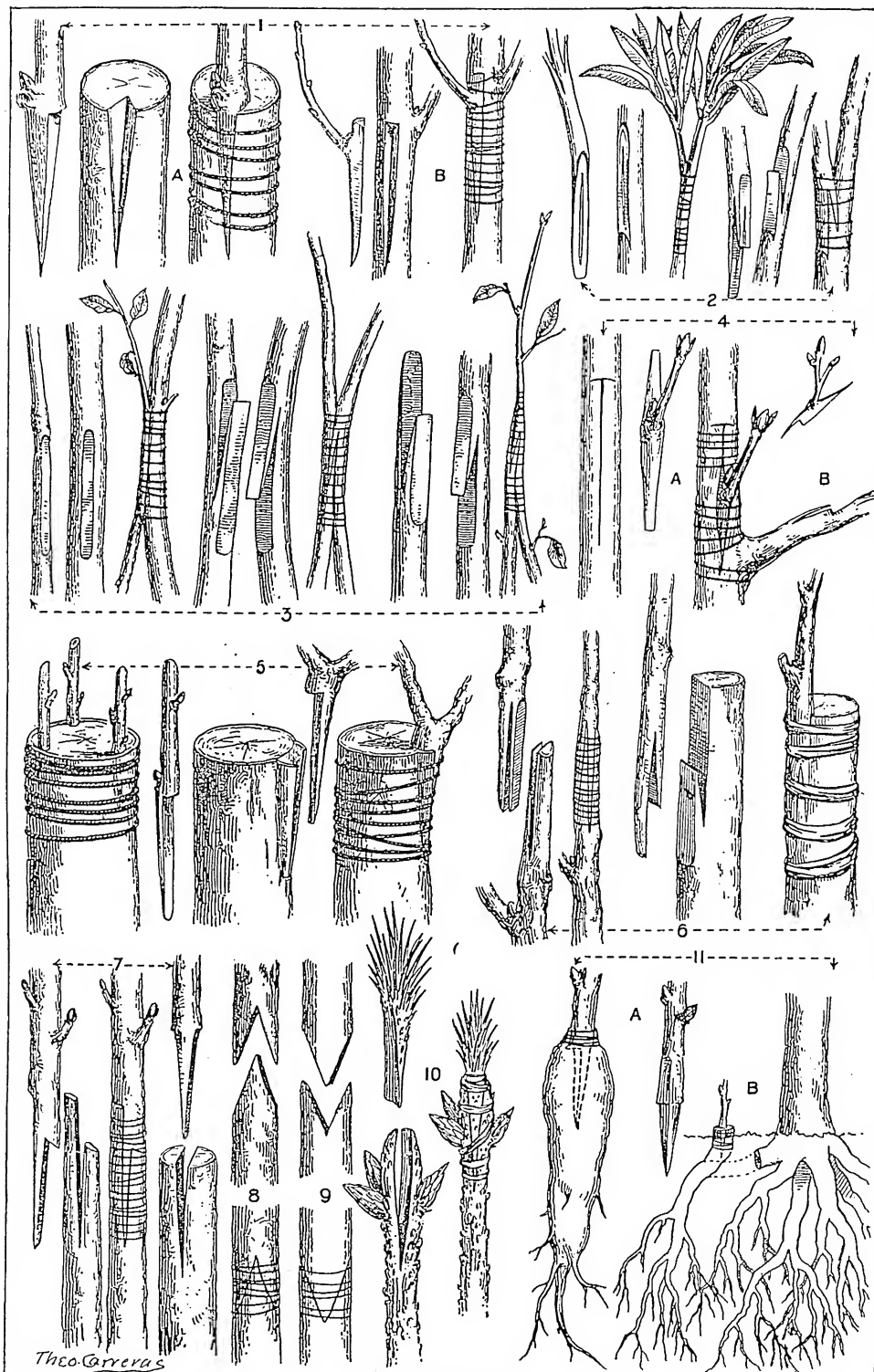
Grafting, a horticultural operation which consists in placing together the two cut surfaces of different plants in such a way that they shall unite and become an organic unity. The rooted plant which is to receive the graft is called the 'stock'; the cutting which is to be applied to the stock, and to obtain its nourishment from it, is called the 'scion.' The object of grafting is usually either to utilize the age and strength of a cheap, or easily obtainable, or exceptionally vigorous stock in order to obtain quickly the fruits or flowers produced by the plant whence the grafts were cut. The graft and the stock must belong to the same botanic family. Grafting should be performed in spring, after the sap has begun to rise, or in autumn, before it has ceased to flow. The methods of grafting

are very various: thus we have grafting by inlaying, by veneering, by in-arching, side-grafting, crown-grafting, whip-grafting, cleft-grafting, and saddle-grafting. All these are fully described and discussed in Baltet's *Grafting and Budding* (trans. 1878). Tongue-grafting is the variety most commonly used in England. The scion is cut with a very long sloping or splice cut; in this a long notch is cut for about two-thirds of its length, so as to have a bud at the end of it. This notch must be quite smooth, and should be made in two clean cuts of the pruning knife. The stock is treated in the same way, so as to have a notch corresponding to that of the scion, which should fit into it accurately. The point is then inserted into the notch, and the parts pressed into each other. Old pack thread or twine, unravelled, is a good material for binding the parts together, but care must be taken to prevent the ligature from interfering when the parts begin to swell. Warm mastic is preferable to grafting clay. Baltet recommends the following mixture. First, melt together resin 2 lbs. 12 oz. and Burgundy pitch 1 lb. 11 oz.; at the same time melt separately suet 9 oz. Pour the suet, when thoroughly melted into the first mixture, stirring it well while doing so. Then add 18 oz. of red ochre, dropping it in gradually in small portions, and stirring the whole for a good while. This is best applied lukewarm and liquid.

Grafton, a British first-class protected cruiser of 3,750 tons and 19 knots, launched at Blackwall in 1892.

Grafton. (1.) Town and episc. see, N.S.W., Australia, on Clarence R., 45 m. from the sea. Coal and gold are mined, and the town has sugar mills. It is the see of both an Anglican and a Roman Catholic bishop. Pop. (1900) 4,174. (2.) Town, Taylor co., W. Virginia, U.S.A., 99 m. S.E. of Wheeling; has flour mills, machinery shops, and iron foundries. Pop. (1900) 5,650.

Grafton, AUGUSTUS HENRY FITZROY, THIRD DUKE OF (1735-1811), English statesman; in 1765, under Rockingham, became Secretary of State, and took part in repealing the Stamp Act. In the following year, when Pitt was appointed prime minister, Grafton became head of the Treasury, and a year later First Lord of the Treasury and the recognized premier; but he soon resigned in favour of Lord North. He, however, joined the second Rockingham ministry as Lord Privy Seal (1782). He was a favourite butt of Junius. His *Autobiography* was published in 1899.



Methods of Grafting.

1. Inlaying: A, crown; n, side. 2. Veneering. 3. In-arching. 4. Side grafting: A, stem; n, branch. 5. Crown grafting. 6. Whip or tongue grafting. 7. Cleft grafting. 8. Saddle grafting. 9. Wedge grafting. 10. Terminal herbaceous grafting. 11. Root grafting: A, dahlias, peonies, etc.; n, trees.

Grafton, RICHARD (d. ?1572), English chronicler and printer. A wealthy London merchant, he assisted Edward Whitechurch to reprint Coverdale's Bible at Antwerp (1537, known as Matthew's Bible), and at Paris (1538), and in England (1539). As 'King's printer' Grafton issued the Prayer-book of 1549. He compiled *Abridgment of the Chronicles of England* (1562), and a *Chronicle at Large* (1568).

Gragnano, tn., prov. Naples, Italy, 2 m. E. of Castellammare; grows red wine and makes macaroni. Pop. (1901) 13,955.

Graham, the Scottish family, is of Anglo-Norman origin, but has for eight centuries been settled in Scotland, holding lands granted to William de Graham by David I. John de Graham fell at Falkirk (1298), his elder brother, Patrick, at Dunbar (1296). His descendant, Patrick, was created Lord Graham about 1445, and the earldom of Montrose was conferred, in 1505, on William, grandson of the first Lord Graham, for his bravery at Sauchieburn (1488). His son, the second earl, fell at Flodden (1513); while John, third earl, was viceroy of Scotland after James VI. succeeded to the English crown; and John's grandson, James (1612-50), was created Marquis of Montrose in 1644 by Charles I. Montrose had taken part in drawing up the Covenant (1638), but finally he declared for the king, and in 1644 attempted to raise the Highlands. But he was defeated at Philiphaugh (Sept. 13, 1645), and in the following year escaped to Norway. In 1650 he returned to Scotland, with the hope of avenging the king's death, but was captured, and hanged by order of the Parliament in the Grassmarket at Edinburgh (May 21, 1650). His honours were restored to his son James, 'the good marquis,' whose grandson James, fourth marquis, who took a prominent part in promoting the union, was created Duke of Montrose in 1707, and became Secretary of State. (See Lang's *John Graham of Claverhouse*, 1905.) James, fourth duke, who died in 1874, was at one time (1866-8) Postmaster-general. Thomas Graham, Lord Lynedoch (1748-1843), born in Perthshire, saw active service at Quiberon, Corunna, Walcheren, and in the Peninsular war under the Duke of Wellington. See *A Book of the Gramhams*, by L. G. Graeme (1904).

Graham, DOUGAL (1724-79), Scottish chapbook writer, was, it is supposed, born at Raploch, near Stirling. He was a deformed peddler, and wrote a rhyming history, entitled *A Full, Particular, and True Account of*

the Rebellion in the Year 1745-6. Afterwards he settled in Glasgow, where he wrote and printed a large number of humorous chapbooks, including *Jocky and Maggy's Courtship* (a clever satire on the disciplinary methods of the kirk), *The History of Buckhaven*, *Simple John*, and *The Comical Transactions of Lothian Tom*. His *Collected Works*, with biography by George Macgregor, appeared in 1883 in 2 vols.

Graham, SIR GERALD (1831-99), English soldier, born at Acton in Middlesex. Having served in the Crimea and in China (1860), he fought in Egypt in 1882-5, commanding at Kassassin and Tell-el-Kebir, and at El Teb and Tamai (1884). He translated Goetze's *Operations of the German Engineers, 1870-1* (1875), and wrote *Last Words with Gordon* (1887). See R. H. Vetch's *Life, Letters, and Diaries of Sir G. Graham* (1901).

Graham, JAMES (1745-94), quack doctor, born in the Cowgate, Edinburgh; settled in the 'Temple of Health,' a grand mansion in the Adelphi, London, fitted up with a 'celestial bed' and 'magnetic throne.' Here he lectured for exorbitant fees, assisted by a woman whom he called the 'Goddess of Health,' Emma Lyon (later Lady Hamilton) served for a time as his type of health and beauty. See Timbs's *Doctors and Patients* (new ed. 1876).

Graham, SIR JAMES ROBERT GEORGE (1792-1861), British statesman, born at Netherby in Cumberland; was returned for Carlisle as an advanced Liberal (1826), and supported Catholic emancipation and advocated the Reform Bill. Accepting office in Lord Grey's cabinet as First Lord of the Admiralty (1830), he resigned it in 1834 on the Irish Church question; then went over to the Tories, and in 1841 became Home Secretary under Sir Robert Peel. In this office he incurred popular dislike by ordering Mazzini's letters to be opened in the post office (1844), and their contents communicated to the Austrian minister. He supported Peel in the repeal of the Corn Laws, but retired with his chief as soon as that measure was carried (1846). He again took office under Aberdeen and Palmerston (1852), but finally retired in 1855. See *Life* by Torrens (1863) and by Lonsdale (1868).

Graham, JOHN, of Claverhouse. See DUNDEE.

Graham, THOMAS (1805-69), Scottish chemist, was born at Glasgow. He became successively professor of chemistry at Anderson's College, Glasgow (1830), at University College,

London (1837), and, in 1855, master of the Mint. His researches on the molecular movements of gases and liquids are classical; he enunciated the law of gaseous diffusion, known as 'Graham's law;' classified bodies into crystalloids and colloids; studied phosphates, and the diffusion of liquids. To him we owe the introduction of bronze coinage. He published *The Elements of Chemistry* (1842). See R. Angus Smith's *Life and Works of T. Graham* (1884).

Grahame, JAMES (1765-1811), Scottish poet, born at Glasgow; was first a lawyer (1791-1809), then went to London and took Anglican orders. His best poems display considerable skill in versification, a keen appreciation of natural beauty, and earnest yet cheerful piety. His best-known works are *The Rural Calendar* (1797), *The Sabbath* (1804), and *British Georgics* (1809).

Graham Land, tract of land, S. Antarctic Ocean, roughly included between 56° and 57° W., and 65° and 69° S.

Grahamston, eccles. par. and tn., half a mile N. of Falkirk, Stirlingshire, Scotland; has coal and iron industries. Pop. (1901) 8,680.

Grahamstown. (1.) Town in the E. of Cape Colony, 106 m. by rail N.E. of Port Elizabeth. It is the seat of an English bishopric, with a cathedral built chiefly after the design of Sir Gilbert Scott, and has a college (St. Andrew's) and botanical gardens. Fishing is carried on. Pop. 10,030. (2.) Or THAMES, tn., in Thames co., North I., N.Z., 46 m. E.S.E. Auckland; has gold mines. Pop. (1901) 5,000.

Graia Alps, that portion of the main Alpine chain stretching from Mont Cenis on the S. to the Little St. Bernard on the N. Its peaks range from 12,000 to 13,324 ft. (Grand Paradis).

Grail, HOLY, the vessel (cup or dish) of the Last Supper, which, according to tradition, was subsequently used by Joseph of Arimathea to collect the blood which flowed from the wounds of Christ upon the cross, and was ultimately brought by Joseph or his descendants to the British Isles. The romances represent the Grail as in the charge of a king of Joseph's race, known as the Fisher King, or Rich Fisher. His successor is to prove his fitness for the office by asking a mysterious question. But the future Grail-winner is unaware of his high destiny, and ignorant of the Grail; thus he fails to put the question, and so involves the land of Britain in mysterious enchantments which only cease when the question is satisfactorily put. With the Grail the

romance writers coupled a bleeding lance, which is sometimes called the 'spear of vengeance,' but is more generally represented as the lance with which the soldier pierced the side of the Saviour. This story, originally independent of the Arthurian cycle, eventually became incorporated with it, and the Grail quest, at first the task of a single predestined hero, became the final and crowning adventure in which all the knights of the Round Table took part. The origin of the story has been variously stated to be a Christian tradition, an Oriental legend, and a Celtic folk-tale; and the credit of inventing the whole story has been ascribed respectively to Walter Map, Chrétien de Troyes, and Robert de Borron. In some of its aspects the Grail closely parallels the Celtic cauldron of wisdom and rejuvenescence. The lance was not originally connected with the Grail, and was equally non-Christian, the name 'spear of vengeance' pointing to a feud-quest. Grail and lance in their earlier form appear to have been folk-tale talismans, and we first meet them connected with the hero we know as Peredur or Perceval, who belongs to the group known as 'formula' heroes. The Joseph of Arimathea legend is based upon the pseudo-gospels, *Acta Pilati* (Gospel of Nicodemus) and *Vindicta Salvatoris*. The claim of Chrétien de Troyes to be the inventor of the Grail legend must be dismissed. The name of Walter Map is only associated with the story in its latest 'Galahad' form. Robert de Borron is certainly the earliest writer whom we find in possession of a clear, well-defined, and coherent Christian Grail tradition; but the probability is that he was not the inventor of the legend. The following are the principal Grail romances, in their probable order of time:—*Perceval: Li Conte del Graal*, by Chrétien de Troyes (ed. Potvin, 6 vols. 1866-71); *Joseph of Arimathea*, by Robert de Borron. *Perceval* is probably not the original work of De Borron, but founded upon it. *Grand St. Graal*, ascribed to De Borron, but most probably the work of a later hand, based upon the *Joseph*; as it now stands it is the introduction to the Galahad quest. These three have been edited by Hucher (*Grand St. Graal*, 3 vols. 1875-8). *Perceval le Gallois*, printed by Potvin (vol. i. of his ed.). *The High History of the Holy Grail*, trans. of above by Dr. Sebastian Evans (2 vols., Temple Classics, 1898). *Queste del Saint-Graal*, ed. Dr. Furnivall for Roxburghe Club (1864); Welsh version of above trans. by Rev. R. Williams (1876); abridged

trans. in Malory (ed. 1897), bk. xiii.-xvii.: here the hero is Galahad. *Parzival*, by Wolfram von Eschenbach (Eng. trans. by J. L. Weston, 1894), the finest of the Grail romances. (*Vide PERCEVAL and WOLFRAM VON ESCHENBACH*.) See *The Legends of the Holy Grail*, by A. Nutt (1902); *Die Sage vom Gral*, by A. Birch-Hirschfeld (1877); *Die Altfranzösischen Gral-Romane*, by R. Heinzel (1892); *Legend of Sir Lancelot*, by J. L. Weston (1901); Vercoutre's *Un Problème Littéraire Résolu: Origine et Genèse de la Légende du Saint-Graal* (1901); and Wesselofsky's *Die Heimath der Legende vom Heil Gral* (1903).

Grain, a unit of weight, originally determined by the average weight of a full grain of wheat. It is now $\frac{1}{7000}$ th of a pound avoirdupois—i.e. $\frac{1}{7000}$ th part of the weight of an imperial gallon of water at 62° F., the barometer being at 30 inches.

Grain, ISLE OF, par. and vil. in Kent, England, between the Medway and the Thames, 11 m. E.N.E. of Rochester; once an island. Its fortifications command the approaches to the Thames and the Medway.

Grain, RICHARD CORNEY (1844-95), English musical entertainer, born at Feversham, Cambridgeshire; took to giving drawing-room entertainments, and in 1870 joined Mr. and Mrs. German Reed in Regent Street, London. This connection lasted till the close of his life. During all these years 56 sketches were presented, 38 being written by Corney Grain himself. These sketches achieved a remarkable popularity, being witty in themselves, and being rendered with admirable verve. See *Corney Grain: a Biography by Himself* (1888).

Grain Coast, part of Guinea between 4° and 7° N. and 7° and 11° W., and including the greater part of Liberia. It was named from its trade in 'grains of paradise.'

Grainger, JAMES (?1721-66), Scottish physician and poet, born at Duns in Berwickshire. Having settled in London, he became acquainted with Dr. Johnson, Smollett, Goldsmith, and other celebrities; took to literature, producing several original poems and translations from Ovid and Tibullus. He then went to St. Christopher, West Indies, in 1759, where he practised medicine and wrote *The Sugar Cane*, a prosaic poem (1763). In 1764 he issued an essay on *West Indian Diseases*. Grainger had an angry controversy with Smollett.

Graining, a name given to a variety of the dace.

Grains of Paradise, the seeds of two African plants, *Anomum granum paradisi* and *A. melegueta*,

belonging to the order Scitamineae. They are aromatic plants allied to the cardamom, and were formerly much used in embalming. The seeds are sometimes known as Guinea grains or Melegueta pepper, and are used in some countries as a condiment.

Grakles, or GRACKLES, are passerine birds related to starlings (Sturnidae), from which they are sometimes separated as a distinct family under the name of Eulatiidae, or tree starlings. They differ from the true starlings in being more arboreal in their habits, in laying spotted eggs, and in having bristles at the gape. An example of a grackle is *Eulabates religiosa* of Southern India and Ceylon, which has black plumage with fleshy yellow wattles on the head. Related to the grackles are the glossy starlings (*Lamprocolius*) of Africa.

Grallatores, or WADERS, an order of birds in the older classifications, including long-legged forms of semi-aquatic habit, such as storks, herons, cranes, rails, plovers, bustards, and so on. But the classification is now abandoned. See BIRDS.

Gramineae, the order of plants containing all the grasses (including bamboos), and constituting the most important order of the vegetable kingdom. See GRASSES.

Grammangis, a genus of tropical orchids of considerable beauty. *G. Huttoni*, from Java, bears racemes of chocolate flowers in summer.

Grammanthes, a one-species genus belonging to the order Crassulaceae. *G. chlorostroma* is an annual plant with reddish-yellow flowers, a native of S. Africa, and half hardy in Britain. It likes a light, well-drained soil and a sunny situation.

Grammar. The practical use made of grammar fosters the tendency to regard it as a body of rules or a code of laws to which speech is subject. The authority of the forms which it prescribes is popularly supposed to depend on their purity, and that is understood to mean their original or 'uncorrupted' character. Such conceptions are quite unscientific. Existing usage is the only standard of speech. Grammar finds its rules in the current practices of the community; its authority is merely that of a guide to what is customary. As every language constantly changes, so does its grammar. There is no criterion by which the forms of a certain period can be selected and made the standard for all time to come. The prevailing linguistic usages of a community or class constitute the grammar of its language or form of speech; their orderly

investigation and statement is the science of grammar.

When a language is spoken over a wide area, it inevitably splits up into a number of dialects. Each of these has its own usages, and therefore its own grammar. In certain circumstances the grammar of a language may be only a series of dialect grammars. The language is then in process of becoming a group of languages. But if at such a stage active communication and intercourse are established between the speakers of the different dialects, a common language will be the result. Generally some favourably situated dialect becomes the medium of intercourse, modified somewhat by the incorporation of elements from other dialects. Literature naturally gives the common language a preference, and a literary development frequently goes hand in hand with the spread of the common language. Its grammar may be called the standard grammar. But the usages of this common language are not therefore superior in purity to the usages of the dialects, and it is quite wrong to suppose that the dialects are corruptions of the common language. Sometimes the usages of the dialects are spoken of as ungrammatical. The statement is unwarranted. The dialects have their own grammar, and are not to be judged by the grammar of the common language. It sometimes happens that there is a language of literature in use which is not fully entitled to be called the common language, because it is not employed in speech (Arabic, Welsh). Owing to the preconceptions or bias of the literary class, it is apt to be taken for granted that this language of literature ought to be the common language of speech also. It may be doubted whether a mere book language is capable of being turned into living speech.

The standard grammar of a language changes as rapidly as dialect grammars, and perhaps more rapidly. The sanction of common usage gives authority even to changes which spring from ignorance and error. Every grammar contains examples of 'correct' forms which are nothing but ancient blunders. 'Riches' is treated as a plural, although historically it is a singular; the initial *n* in 'nickname' does not belong to the original word, which is 'ekename'; 'children' has two plural endings.

The task of determining the general usages which are the subject of grammar is not altogether a simple one. The grammarian may prefer the usage of those who employ habitually nothing but the common language, and of those who move

constantly in circles where it is so employed (at court, in the universities, on the stage). But even then variations remain. There are always transition periods in which the old and the new exist side by side. In such cases, and in others also, the scientific grammarian has no choice but to recognize more than one usage as grammatical. Grammars should not condemn novelties as such; most novelties have time on their side.

In the usages of the common language there is regularly a difference between the literary and the colloquial forms. A comprehensive standard grammar should include both. The spoken forms are not to be ignored on the ground that they are imperfect when judged by literary standards. On the contrary, they are the perpetual spring from which the language of literature is replenished and renewed. Besides, in the case of living languages there is a practical demand for colloquial grammar which cannot be satisfied by mere literary grammar. In the acquisition of a language it is invariably best, when possible, to secure a knowledge of the colloquial forms first. The more the spoken language differs from the written, the more advisable is it to follow this order of acquisition. The foreigner should never be deterred by statements that the spoken language is ungrammatical or follows no rule. In the latter case the assertion can rest only on ignorance; in the former the meaning simply is that the spoken differs from the literary language, and is less archaic.

Recent grammarians generally include in their treatment of their subject some account of the history of the sounds, forms, and constructions of the language with which they deal. This procedure has many advantages. The 'irregularities' of the old grammars disappear; the forms and idioms of the language are made intelligible; it becomes clear that the grammar of one period is not that of another, and that standard forms are simply those of a particular date. The way is prepared for a perception of the fact that literary excellence is not the prerogative of any grammar. But grammar is not the history of a language, and no language can be treated as if it had only one grammar. Every language so changes from period to period that in the course of its history it supplies the material for a series of grammars. The characteristics of individual words, their pronunciation, meaning, and construction, are recorded in dictionaries, and belong to the province of the

lexicographer. Grammar is concerned rather with the features which words and groups of words have in common. It deals with three classes of facts, and therefore has three divisions—phonology, morphology, and syntax. Phonology treats of the sounds of a language, and also of the written symbols which may be employed to represent these sounds. Morphology treats of the structure of words, and of their inflections. Syntax treats of the proper use of word forms, and of the customary arrangement of sentences. The right of phonology to a place in grammar has not always been adequately recognized. It is usual to speak of grammatical forms and constructions, but not of grammatical pronunciations. But the expression 'standard pronunciation' conveys the same meaning, and an exposition of the sound system of a language is an essential part of grammar.

Phonology.—The grammarian's first duty is to enumerate and describe the constituent sounds of the language with which he has to deal. To accomplish this scientifically, he must be equipped with a knowledge of phonetics. The only satisfactory way of identifying sounds is to state the manner of their formation. Quite new sounds can only be acquired by the help of a teacher. But the grammarian, by describing them in terms of phonetics, may indicate their character, and point out where and to what extent the learner has to deal with what is unfamiliar. The particulars of orthography are contained in dictionaries, but a treatment of its general principles is a part of grammar. The grammarian investigates and explains by what means and with what success the language he treats of is expressed in writing. He gives an account of the forms and values of its written symbols. The claim made for some languages (*e.g.* Welsh), that a knowledge of the alphabet is sufficient to determine the spelling and pronunciation of words, always turns out to be unfounded. As an introduction to morphology, phonology should include some account of the phonetic changes which accompany word composition and inflection. The laws of stress and intonation also belong to its province, and deserve more adequate treatment than they generally receive. In every part of phonology the historical element is specially important.

Morphology.—This part of grammar includes (a) a classification and analysis of word stems; (b) a similar treatment of inflections. The first division is closely related to etymology, and

the second has been termed accidance.

(a) Words which are logically of the same class tend to assume similar forms linguistically. The 'parts of speech,' for instance, are distinguished to a large extent by their acquisition of forms special to each. There are also distinctive types of verbs and nouns which coincide with differences of meaning or inflection. So far as words of a distinctive phonetic type are bases for special modes of inflection, or possess a distinctive meaning, they are a subject for grammatical treatment. Types with a distinctive meaning are formed by reduplication and in other ways, but principally by word composition. Groups with a common meaning are then constituted by the presence of common prefixes and suffixes. These for the most part are worn-down words, although not always plainly recognizable, nor even still living in the language as separate words. The personal endings or prefixes of verbs are often clearly personal pronouns. It may be supposed that there was a stage in the history of the oldest languages in which simple stems, monosyllabic or otherwise, were alone employed. Difference of type is not essential to the apprehension of the meaning and function of words; for example, English 'bark' is both a noun and a verb. The languages called 'isolating' are said not to exhibit any variations of form corresponding to variations in meaning. Chinese is reckoned an example (see below).

(b) Inflection is the variation of which words are capable in virtue of their belonging to one of the classes known as the parts of speech. Verbs, nouns, and adjectives show most susceptibility to inflection. Inflected forms either express relation to other words, as case, or define some psychological element contained in the meaning of the word—e.g. gender, number, tense. Their origin may be quite independent of the purpose which they finally serve. Sometimes they are mere phonetic variants transferred to a special use, or formations according to the analogy of these variants. Sometimes the constant association of particular words in certain relations leads to subordinate words becoming formative syllables (initial, final, and even medial), which may be attached to all similar stems. The latter class of inflections have a distinctive meaning from the commencement. Languages vary greatly in the extent and character of their inflections. They are not of the essential character that a narrow survey of the field might

lead one to suppose. The Semitic languages have no verb forms to indicate differences of time (tenses). Other languages are said to be altogether destitute of inflections. It may be supposed that the oldest languages were at one time uninflected. In many cases the origin and development of the inflections for gender, number, voice, etc., can be traced historically. But Chinese is not to be regarded as a clear case of the survival of a primitive uninflected language. It may rather be a language which has lost the inflections it once possessed (cf. Jespersen's *Progress in Language* (1894). It is remarkable how some languages have built up an elaborate system of inflections, only to lose them again in large measure—e.g. Greek, Arabic. It may also be suggested that modern Chinese speech offers examples of new formative elements imperfectly attached to the stems, although not, of course, represented as such in the native system of writing.

Syntax.—The name syntax is most appropriate to that part of grammar which treats of the arrangement of sentences; but it also investigates and explains the use made of inflectional forms within a sentence. It treats of the manner in which words are combined to express thought. A sentence in its simplest form is an expression of relation between ideas. Much may be left to the intelligence of the hearer. The exact relation between subject and predicate is not always formally distinguished—e.g. 'No work, no pay;' 'Water is a fluid.' Even the subject or the predicate itself may be wanting—'The dog!' Tone and gesture are indications of meaning which are lost in written speech. What is left is the arrangement of words and their inflections. Such relations are expressed by the terms 'subject,' 'predicate,' and 'object' find expression in a particular order of words; adjectives which are attributes are distinguished by their position from those which are predicates, and so on. When a language possesses a highly-developed inflectional system, it is less bound to a rigid sentence order, as in Latin poetry. In the use of inflections, a notable feature is the endeavour to establish concord, as between adjective and noun, verb and subject. This effort supplies adjectives with a whole set of inflections. It involves also conflicts between the demands of grammatical concord and the older practice, or the psychological conceptions of the community—e.g. in the treatment of collectives as singulars or plurals; in the Semitic use of the verb where the subject is plural or

even feminine (cf. Welsh, where also the verb precedes the subject).

Analysis of the usages of cases, tenses, and other inflections does not necessarily discover one ultimate explanation for all the meanings of each form. Cases, for instance, are necessarily employed in relations to which they were not originally assigned, because of the lack of a sufficient number of special forms for each relation. Or the popular interpretation of the meaning expressed in a certain position may be different from that which led to its choice for use there. In both instances a new relation is expressed by the cases in question, and this is capable of transference by analogy to other sentences and circumstances. After a prolonged development there may be very little logical coherence in the use of inflections.

The differentiation of types of sentences supplies a large amount of material to syntax. Interrogative, optative, and many other kinds of sentences come to be distinguished by their special arrangement and the employment of special forms.

The Parts of Speech.—Tested logically, the division into parts of speech is found to rest on a very imperfect analysis; and, besides, some of the parts of speech are constituted by the discharge of functions which do not exist in every stage of the development of language: for example, prepositions, conjunctions, and adverbs are not primary or necessary elements of speech. The 'parts of speech' are merely an enumeration of the principal word classes of Greek and Latin grammar. See, further, PARTS OF SPEECH.

See H. Sweet's 'Words, Logic, and Grammar,' in *Trans. Phil. Soc.* (1875-6); A. H. Sayce's *Introduction to the Science of Language* (2 vols. 1880); H. Paul's *Principien der Sprachgeschichte* (3rd ed. 1898; trans., *Principles of the History of Language*, 2nd ed. 1888). The standard comparative grammar of the Indo-European languages is Brugmann and Delbrück's *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen* (5 vols. 1887-1900; trans., *Comparative Grammar of the Indo-Germanic Languages*, 4 vols. and index, 1888-95). For English, E. Mätzner's *English Grammar* (trans., 3 vols. 1874) and H. Sweet's *A New English Grammar, Logical and Historical* (2 vols. 1892-8) are of great service.

Grammatophyllum, a genus of stove epiphytal orchids, natives of the Malay Archipelago. They are very beautiful, but are not free-flowering. They do best in pots full of peat.

Gramme, the unit of weight in the metric system, is the thousandth part of the weight of a litre of distilled water at 0° C.; in other words, it is the weight of a cubic centimetre of distilled water at this temperature. It is equal to 15.43248 (English) grains. The subdivisions of the gramme are expressed by Latin prefixes—decigramme ($\frac{1}{10}$), centigramme ($\frac{1}{100}$), milligramme ($\frac{1}{1000}$); the multiples by Greek prefixes—decagramme (10 grammes), hectogramme (100 grammes), kilogramme (1,000 grammes). The kilogramme is equal to 2.2 lbs. avoirdupois.

Gramme Machines. See DR-NAMO.

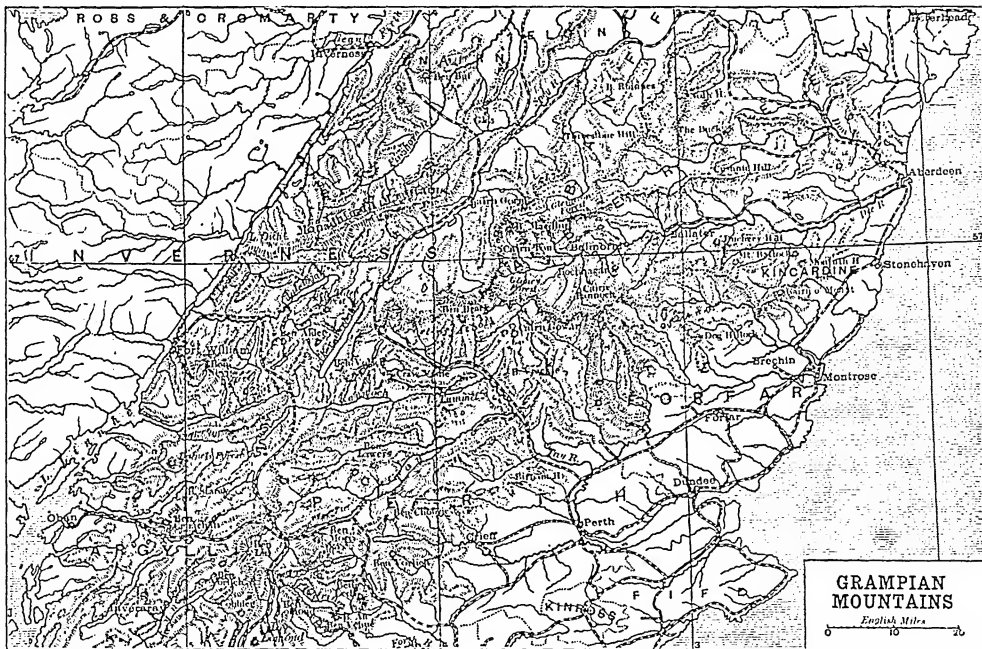
office with the Ollivier ministry after the battle of Wörth. In his work, *La France et la Prusse avant la Guerre* (1872), he offered an explanation of his policy.

Gramont, PHILIBERT, COMTE DE (1621-1707), a courtier of Louis XIV. of France, and subsequently of Charles II. of England, was forced to leave France on account of his intrigues. The celebrated *Mémoires* of Gramont, written in French, were probably from the pen of his wife's brother, Count Anthony Hamilton, although revised by Gramont. A brilliant picture of the court life and of some of the leading characters of the age, it is also valued for its literary merit. Among the best

Tay, and Forth from the south. (2.) Mountain range, Victoria, Australia; forms the western termination of the Great Dividing Range. The principal peak is Mount William (3,827 ft.).

Grampound, mkt. tn., Cornwall, England, 6½ m. S.W. of St. Austell. John Hampden was M.P. for the town in 1620. Pop. of dist. (1901) 6,027.

Grampus, a name given in popular language to the killer whale (*Orca gladiator*), and as a scientific name to a rare dolphin, Risso's dolphin (*Grampus griseus*). The killer is the most ferocious of the dolphin family, and one of the largest of that family. It attains a length of at least twenty



Grammichele, tn., Sicily, Italy, prov. Catania, 33 m. by rail S.W. of Catania. It has stone and clay quarries. Pop. (1901) 15,017.

Grammont, or **GEERTSBERGEN**, tn., Belgium, prov. East Flanders, 22 m. by rail S.E. of Ghent; it has an episcopal college, and makes lace and textiles. Pop. (1900) 12,000.

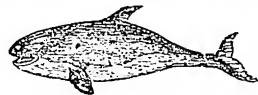
Gramont, ANTOINE ALFRED AGÉNOR, DUC DE (1819-80), French statesman, born in Paris. Prince Louis Napoleon nominated him ambassador to Rome (1857), and then to Vienna (1861). Recalled in 1870 to take up the ministry for foreign affairs, he manifested an anti-Prussian feeling, which probably hastened the Franco-German war. He went out of

English editions are Bohn's (1846) and Nimmo's (1889).

Gramophone. See TALKING MACHINES.

Grampians. (1.) Mountain system, Scotland, separating the Lowlands from the Highlands, and extending from Argyllshire and Dumbartonshire to the coasts of Aberdeen and Banff. On the south side the slopes are gentle and pastoral, but on the north side the general appearance is rugged and wild. The principal heights are Ben Nevis (4,406 ft.), Ben Cruachan, Ben Macdui, Cairngorm, Schiehallion, and Cairntoul. It forms the watershed for the tributaries of the Deo, Don, Spey, and Findhorn from the north, and the Esk,

feet, and has a conical and depressed head without any beak. The colouring is remarkable; for though, generally speaking, black above and white below, the white spreads over the sides of the body in a curiously-shaped marking,



Grampus.

and there is a large white streak above and behind the eyes. The name 'killer' is given on account of their ferocious habits, for the animals combine in small packs to hunt down and kill the largest

of the whales, and also pursue and swallow alive the small dolphins and porpoises. When seen in the water, killers can be recognized by their tall and nearly vertical dorsal fin, which is largest in the males. The animals occur in practically all seas. Risso's dolphin is a rare cetacean, occurring in all seas, and reaching a length of about thirteen feet. It is remarkable for the striped nature of the skin.

Gran, in Hungarian *Esztergom*. (1.) County of Hungary, on both sides of the Danube, between Komorn and Waitzen. Area, 434 sq. m. Pop. (1900) 86,659. (2.) Chief tn. of above co., and archiepisc. see, 23 m. by rail w. of Waitzen. Its imposing cathedral, built in the Italian renaissance style in 1820-56, crowns a hill that overlooks the Danube.

coal, and has textile factories, iron works, and tanneries. Area, 4,928 sq. m. Pop. (1900) 492,460. It was from the 13th to the end of the 15th century the seat of a Moorish kingdom, formed after the collapse (1236) of the caliphate of Cordova, though from 1246 it was tributary to the kings of Castile. Its overthrow by Ferdinand the Catholic in 1492 was caused by the refusal (in 1476) of its Moorish sovereign to pay the customary tribute. See Prescott's *History of the Reign of Ferdinand and Isabella* (new ed. 1892); Lafuente y Alcantara's *Historia de Granada* (1843-6); and Washington Irving's *Chronicle of the Conquest of Granada* (new ed. 1895). (2.) City, chief tn. of above prov., is an ancient Moorish city, the seat of the last Moslem king, and was conquered

Granada, LUIS DE, whose real name was LUIS DE SARRIA (1504-88), Spanish mystic and religious writer, born at Granada, and entered the Dominican order. His didactic homilies, sweet, eloquent, and persuasive, are still much read in Spain, though in their original form they were placed on the *Index Expurgatorius*. The principal of them are *Guia de Pecadores*—'Sinners' Guide' (1614; new ed. 1803); *Doctrina Cristiana*; *Memorial de la Vida Cristiana*—'Memorial of Christian Life' (1831). His works were published in Barcelona (1615), and have been frequently reprinted and translated. See Hume's *Spanish Influence on English Literature* (1905), Rousset's *Mystiques Espagnols* (2nd ed. 1869), and *Life*, in Spanish, by Cuervo (1895).

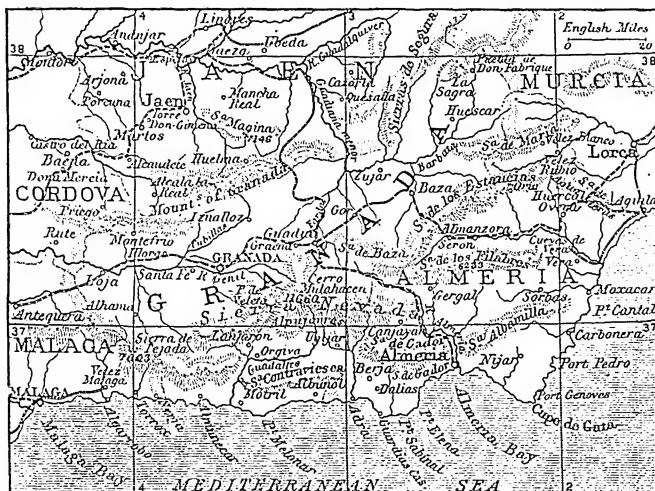
Granadilla. See PASSIFLORA-CEAE.

Granby, JOHN MANNERS, MARQUIS OF (1721-70), English general, was the eldest son of the third Duke of Rutland, and fought at Culloden in 1745. Second in command at the battle of Minden (1759), he afterwards commanded the whole of the British forces in Germany, and in 1766 was appointed commander-in-chief of the British army. He was M.P. for Grantham (1741 and 1747) and Cambridge (1754-70), and his popularity is attested by the frequent occurrence of his portrait as a public-house sign. He was a butt of Junius.

Gran Chaco, EL, dist. of S. America, comprising parts of S.E. Bolivia, S.W. Brazil, W. Paraguay, and N. Argentina, with an area of over 200,000 sq. m. The surface is mostly flat, slightly sloping to the s.e. The greater part is sandy, but large tracts are covered with forest. In the wet season the rivers are subject to floods, and inundate vast areas, leaving lakes or swamps which persist for most of the year. The district is occupied by a few tribes of mostly hostile, uncivilized natives, and is quite uncultivated. Systematic exploration of the region is being undertaken by Argentina and Bolivia.

Grand, riv., U.S.A., one of the main forks of the Colorado of the w.; rises in Middle Park, Colorado, and with a general s.w. course cuts a succession of cañons through ranges and plateaus to its junction with the Green in S.E. Utah. Its length is 348 m., and the area of its drainage basin 26,472 sq. m.

Grand, SARAH, pen-name of FRANCES ELIZABETH M'FALL (1862), English novelist, was born in Ireland. She established her reputation by her first novel, *Idealta* (1888). Her other works



Granada.

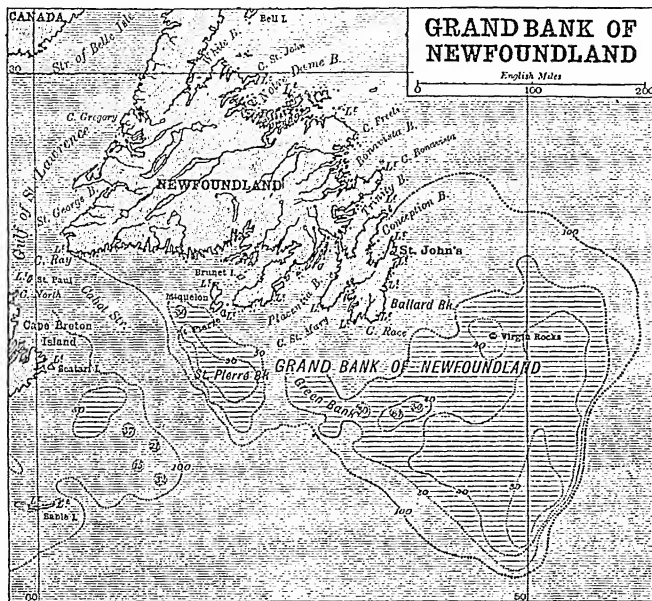
Beside it stands the palace (1882) of the archbishop, who ranks as prince-primate of Hungary. Distilling, milling, and other industries are carried on. There are mineral springs. Gran is identified with the 'Eitzelburg' of the *Nibelungenlied*, and was the birthplace of St. Stephen, first king of Hungary. Its ancient prosperity was destroyed by the Mongols in 1241. From 1543 to 1683 it was principally in the power of the Turks. Pop. (1900) 16,948.

Granada. (1.) Province of S. Spain, comprising the modern provinces of Granada, Almería, and Málaga, is a mountainous country, with fine fertile plains, mainly watered by the river Jenil, the *vega* (plain) of Granada being famous throughout Spain for its beauty and luxuriance. It produces sugar and beetroot, also

by Ferdinand and Isabella in 1492. Beautifully placed (alt. 2,200 ft.) on the slope of the Sierra Nevada, it enjoys a delightful climate, and possesses the famous palace of the Alhambra, and other picturesque structures of Moorish character. It is the seat of an archbishop, and has a university and a richly-decorated renaissance cathedral (1529), containing the tombs of Ferdinand and Isabella, Philip I. and his consort Juana. In the church of San Jerónimo is the cenotaph of Gonsalvo de Cordova. Liqueurs, textiles, paper, and soap are manufactured. Pop. (1900) 75,900. (3.) Town, cap. of prov. of same name, Nicaragua, Central America, on Nicaragua Lake, 28 m. by rail s.s.e. of Managua; exports indigo, wool, hides, and cacao. 'Panama chains' (gold wire) manufactured. Pop. 25,000.

are *The Heavenly Twins* (1893); *Our Manifold Nature* (1894); *The Beth Book* (1897); *Babs the Impossible* (1901). Her writing is clever, often humorous, and epi-

Ching-kiang—i.e. before crossing the Hwei—and travel the rest of the distance to Peking by land. See H. Havret's *Le Canal Impérial*, *Variétés Sinologiques* (1894).



grammatic; but her novels are overweighed with reflections, and the plots are loosely constructed.

Grand Bank, submarine plateau of some 500,000 sq. m., with a depth of from 10 to 160 fathoms, extending S.E. from the coast of Newfoundland. The banks swarm with codfish, and the fishery occupies some 100,000 fishermen (British, American, and French).

Grand Bassam. See **BASSAM**.

Grand Canal (Chinese, *Yün-liang-ho*, 'grain transport'; *Yün-ho*, 'transport'; and *Yu-ho*, 'imperial river'), extends from Hangchow to Tientsin, nearly 1,000 m. The S. section, extending from Hangchow to the Yang-tse-kiang (260 m.), was constructed between 605 and 616 A.D. The section from the Yang-tse-kiang to the Hwei R. (130 m.) was opened as early as 486 B.C., but the present scheme dates from the latter part of the 18th century. To protect the canal from sudden floods, a double series of lakes has been formed on its W. side, through which the water is gradually distributed to the polder lands beyond, while the main body of the stream empties itself into the Yang-tse-kiang. The section N. of the Hwei was built by Kublai Khan's orders in 1289-92 A.D., but is in such bad condition that travellers generally leave their boats at

Grand Canary. See **CANARY ISLANDS**.

Grand Cayman. See **CAYMANS**.

Grand-Combe, LA, tn., dep. Gard, France, 30 m. N.W. of Nîmes; with important coal mines, also glass works and zinc mines. Pop. (1901) 11,484.

Grande Chartreuse. See **CHARTREUSE, LA GRANDE**.

Grande, the name of the highest rank of Spanish nobility, who were possessed of very extensive privileges. The grandees were originally great feudatories of the crown; but Charles V. converted them into a court nobility, and excluded them from the national assembly of the Cortes. Since the Napoleonic era they have virtually lost their former privileges. The collective body of the grandees is called *La Grandeza*, and they are senators by prescriptive right.

Grand Falls, cataracts on Grand or Hamilton R., Labrador, Canada, with a total descent of 2,000 ft., and comprising two falls of over 300 ft. each.

Grand Forks, city, N. Dakota, U.S.A., the co. seat of Grand Forks co., on Red R., about 200 m. E.N.E. of Bismarck. It is a lumber town, with flour mills. The state university (1884), St. Bernard's College (R.C.), and the North-western Normal College are situated here. Pop. (1900) 7,652.

Grand Haven, cap. of Ottawa co., Michigan, U.S.A., on Lake Michigan, at the mouth of the Grand R., 31 m. by rail W. by N. of Grand Rapids. It ships fruit, grain, and timber, and has manufactures of engines, refrigerators, and furniture. Pop. (1900) 4,743.

Grand Island, city, Nebraska, U.S.A., the co. seat of Hall co., on Platte R., 90 m. W. of Lincoln. Here is Grand Island College (1892). Pop. (1900) 7,554.

Grand National. See **RACE MEETINGS**.

Grand Popo, tn., French Guinea, W. Africa, 15 m. W. of Whydah. Pop. 2,000.

Grand Pré, or **LOWER HORTON**, post vil., King's co., Nova Scotia, Canada, 48 m. N.W. of Halifax. It is the scene of Longfellow's *Evangeline*.

Grand Prix de Paris. See **RACE MEETINGS**.

Grand Rapids, city, Michigan, U.S.A., the co. seat of Kent co., on the Grand R., at the head of navigation, 155 m. W. of Detroit. It manufactures furniture, pulp, paper, flour, and there is a large lumber industry; large gypsum quarries close by. The city is both a Protestant and a Roman Catholic episcopal see. Pop. (1900) 87,565.



Grand Canal.

Grandson, or **GRANSON**, small tn., with a fine old castle, in the Swiss canton of Vaud, near the S.W. extremity of the Lake of Neuchâtel. It was the scene of

the defeat (March 2, 1476) of Charles the Bold, Duke of Burgundy, by the Swiss. Pop. (1900) 1,771.

Grand Theatre, Islington, London, was at first the Philharmonic Music Hall, built in 1870, and was renowned for opera bouffe. In 1882 the hall was destroyed by fire, and being rebuilt in 1883, was called 'The Grand.' This house was burnt down in December 1887, and again in 1900, and the present theatre was then erected.

Grand Trunk Pacific Railway, Canada. This line will form a trunk line across Canada, connecting the present Grand Trunk Railway with the Pacific. From Moncton, on the Atlantic, to Winnipeg (1,900 m.) the Canadian government will build the line and lease it to the company; from Winnipeg to the Pacific (1,500 m.) the company will construct and own the line. Upwards of 1,000 m. of branches will be constructed, and the whole line will include 4,520 m. of railway. The approximate total capital is \$176,600,000, and the estimated cost of construction is about £30,000,000.

Grand Trunk Railway, Canada, was first incorporated in 1851, but in 1882 it was amalgamated with the Great Western Railway, and later with the Great Northern Railway. Several other smaller lines have since been absorbed, and the company now owns a total mileage of 2,978, and controls a further 574 miles. The eastern termini of the system are Quebec and Portland (Maine), and it extends westwards through Montreal to Detroit, Chicago, Grand Haven, and Muskegon. The ordinary stock amounts to £22,475,985. For the year 1904 the gross receipts were £5,689,130; working expenses, £4,100,660; net receipts, £1,588,470; balance available for dividend, £561,521.

Grandville, pseudonym of JEAN IGNACE ISIDORE GÉRARD (1803-47), French caricaturist, born at Nancy. While yet young he won considerable reputation by his published sketches, entitled *Les Tribulations de la Petite Propriété*, *Les Plaisirs de Tout Age*, and especially *Les Métamorphoses du Jour* (1828). His illustrations to *La Fontaine's Fables*, *Gulliver's Travels*, *Don Quixote*, and other works, were as successful as the political caricatures he contributed to several French journals were humorous and brilliant. See *Life*, in French, by Blanc (1855).

Grangemouth, seapt. tn., Stirlingshire, Scotland, at the entrance of the Forth and Clyde Canal, 3 m. N.E. of Falkirk. New docks are nearing completion,

and will give an additional quay space of about 7,500 ft. There are shipbuilding yards and saw-mills. The chief exports are timber, pig-iron, and iron ore. Coal mines are found in the vicinity. Pop. (1901) 8,386.

Granger, JAMES (1723-76), English biographer, born at Shaston, in Dorsetshire. Entering the church, he became vicar of Ship-lake, Oxfordshire. His *Biographical History of England from Egbert to the Revolution* (1769) was one of the first works of the kind into which portraits of the subjects were introduced. Granger owned a collection of 14,000 engraved portraits. A continuation of the *History* was published in 1806. See *Granger's Correspondence and Miscellanies*, ed. by J. P. Malcolm (1805).

Grangers, the popular name of a kind of farmers' trade union established as the National Grange of Patrons of Industry at Washington, D.C., by a government official named Kelley, in 1867. Although it was by its constitution non-political, it exercised political influence in promoting legislation against railway monopolies and excessive rates. The education of the farmer in the latest methods of agriculture, and the application of the principle of co-operation to the purchase of seed, machinery, and ordinary supplies, and to the marketing of products, were its chief objects.

Granicus (mod. *Bigha Chai*), river of Asia Minor, rising in Mt. Ida, and falling into the Sea of Marmora. It was famous for Alexander the Great's victory over the Persians in 334 B.C.; also for a victory of Lucullus over Mithridates in 73 B.C.

Granier de Cassagnac. See CASSAGNAC.

Granite is a typical igneous rock, which has cooled very slowly and under great pressures. It is holocrystalline—i.e. contains no non-crystalline matter—and consists of quartz and orthoclase, with biotite, muscovite, hornblende, or augite. The name is reserved for a rock in which both muscovite and biotite are present. Aberdeen granite is a true 'granite.' Hornblende granite occurs in Kirkcudbrightshire, tourmaline granite in Cornwall, augite granite in the Cheviot Hills. Many minerals in addition to those mentioned above may be found in granite. Of these the commonest are plagioclase felspar, oxides of iron, apatite, zircon, sphene, garnet, epidote, allanite, cordierite, topaz, and tinstone. By the decomposition of these primary or original minerals many secondary products are formed, such as calcite, limonite, kaolin, and chlorite.

The red colour of the granite of Shap Fell in Cumberland and of the Peterhead granite is due to the felspar having been stained by iron oxides. Syenites, diorites, gabbros, greenstones, granophyres, and in some cases even grits, are all bought and sold in Britain as granites.

Granites occur mostly in great masses, known as bosses, which may cover hundreds of square miles of country. As they are plutonic rocks, which cooled at some depth from the surface, outcrops of granite are most frequent in regions composed of ancient rocks; but, contrary to former belief, it is now certain that granites may be of all ages, and though most of them are Palæozoic, some are no older than the lower Tertiary. The granites of Skye and of Arran in Scotland belong to this latter group.

In natural exposures of granite, the presence of joints or divisional planes, along which the rock



Granite.

readily opens up, may give it a columnar or a tabular aspect. Weathering takes place most rapidly in the joint planes, and great blocks often lie strewn over the ground. The 'granite tors' of the west of England are produced in this way, and 'rocking stones' are frequently found in regions of granite.

In England the granites of Cornwall are the most important, but the Mount Sorrel (Leicestershire) granite and the Shap granite are also very widely known. In Scotland the granites of Aberdeen, Peterhead, Kemnay, Dalbeattie, Creetown, and Ross of Mull are very largely quarried. The Newry granite of Ireland is well known. In the Isle of Man, Wales, and the Channel Islands there are excellent granites; and in North America, Canada, Norway, Sweden, Russia, France, and Germany much granite is quarried. See Harris's *Granites and our Granite Industry* (1888), and Merrill's *Stones for Building and Decoration* (1897).

Granja, LA., or **SAN ILDEFONSO**, tn., prov. Segovia, Spain, 7 m. E.S.E. of Segovia, has the summer palace of the kings of Spain, built on N. slopes of Guadarramas by Philip V. in 1724-7, and containing his tomb (alt. 4,150 ft.). Granja is now a fashionable summer resort. Pop. (1901) 3,388.

Granollers, tn., prov. Barcelona, Spain, 20 m. N.N.E. of Barcelona, has manufactures of iron and woollen goods. Pop. (1900) 6,755.

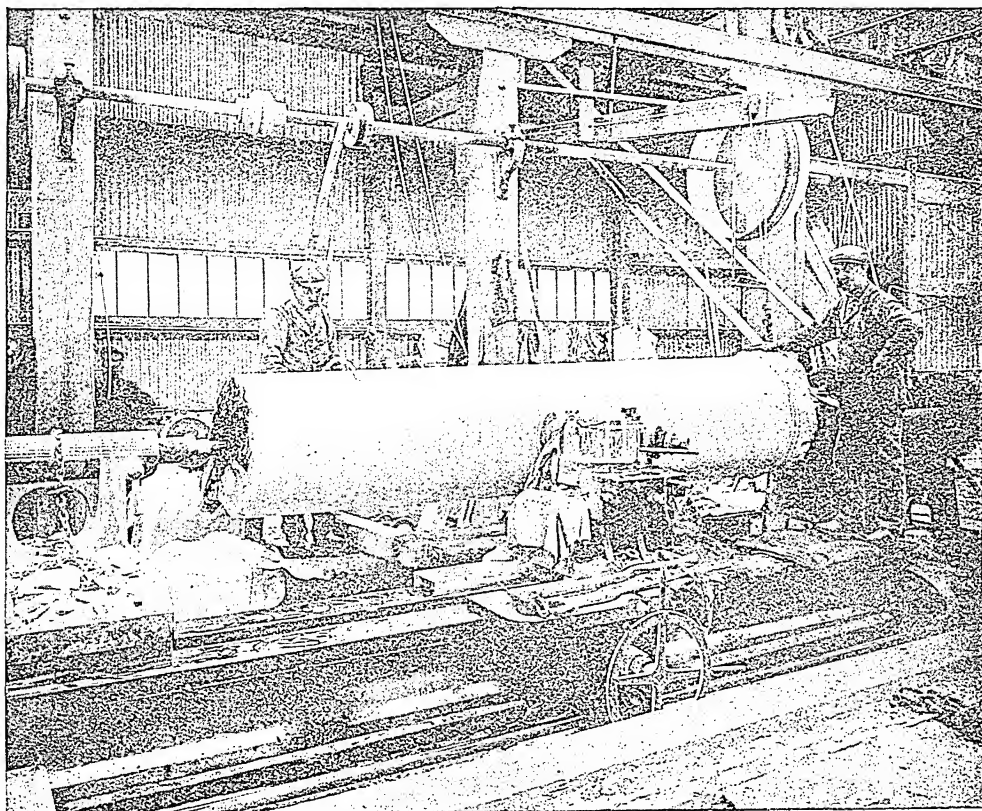
Gran Sasso d'Italia, mountain-knot of the Apennines, in 42° 20' N. and 13° 45' E. Its highest summit (the loftiest in the Apennines) is Monte Corno (9,585 ft.).

Granson, Switzerland. See **GRANDSON**.

Grant, in English law, is a conveyance of property by deed. Formerly, estates in possession could only be conveyed by feoffment, and only estates in expectancy and incorporeal here-

cess; but nearly all his later ventures ended disastrously. He represented Kidderminster in the House of Commons from 1865-68 and from 1874-80. In 1874 he bought Leicester Square (then waste land), converted it into a garden, and presented it to the Metropolitan Board of Works for the use of the public. Grant died a comparatively poor man, at Bognor, Sussex.

Grant, **SIR ALEXANDER** (1826-84), was born in New York, and



Granite Working: Turning a Column.

(Photo by Hardie, Aberdeen.)

Granophyre, an igneous rock which has a similar composition to granite, but is finer grained, and with porphyritic structure. Granophyres usually form dykes and veins, and often radiate from granite masses. In Skye, Arran, and the Highlands of Scotland they occur in immense numbers, also in North Wales, the Lake District, Cornwall, and Ireland. They are much used for road-mending, and also make excellent paving-sets. See Harker's *Petrology* (1897), Merrill's *Rocks, Rock Weathering, and Soils* (1897).

ditaments, such as rents, advowsons, etc., of which there could be no livery of seisin, were conveyed by grant; but the Real Property Act, 1845, made grants effectual for the conveyance of all kinds of real property. See J. Williams's *Law of Real Property* (19th ed. 1901).

Grant, **ALBERT** (1830-99), known as **Baron Grant**, British company promoter, born in Dublin, son of W. Gottheimer of London. Assuming the name of Grant, he commenced floating companies with astonishing suc-

cess; but nearly all his later ventures ended disastrously. He represented Kidderminster in the House of Commons from 1865-68 and from 1874-80. In 1874 he bought Leicester Square (then waste land), converted it into a garden, and presented it to the Metropolitan Board of Works for the use of the public. Grant died a comparatively poor man, at Bognor, Sussex.

Grant, **CHARLES, LORD GLENELG** (1778-1866), English politician, was born at Kidderpur,

near Calcutta. In 1811 he was elected member for the Inverness burghs. He subsequently represented the county, and remained in the House of Commons until he was made a peer in 1835. He was Chief Secretary for Ireland (1819-23) under Lord Liverpool, and afterwards (1823-7) vice-president of the Board of Trade. When Canning was premier, Grant became President of the Board (1827-8). In 1830 he joined the Grey ministry as President of the Board of Control, and was Colonial Secretary under Lord Melbourne (1835-9). In consequence of the unpopularity of his Canadian policy he retired in 1839.

Grant, Sir Francis, Lord Cullen (1658-1726), Scottish judge, born at Ballintomb, Morayshire. He was admitted advocate (1691), created lord of session (1709). A profound lawyer and upright judge, he was a warm supporter of William III. and of the union, and was the author of works on reformation of manners and the patronage question in the Scottish Church.

Grant, Sir Francis (1803-78), Scottish portrait painter, born at Edinburgh. He first exhibited at the Royal Academy in 1834. *An Equestrian Group of Queen Victoria*, and others, exhibited in 1840, made him fashionable, and in forty-five years he showed 253 portraits at Burlington House. Elected A.R.A. in 1842, and R.A. in 1851, he became president in 1866. Several works by Grant are in the National Portrait Gallery, London, and the Scottish National and National Portrait Galleries.

Grant, James (1822-87), British novelist, born in Edinburgh. In all he wrote about fifty novels, dealing chiefly with military life or stirring historical events. Some of these are *The Romance of War*, a tale of the Peninsular campaign (1846); *Bothwell* (1854); *Jane Seton* (1853); *The Cavaliers of Fortune* (1859); *Only an Ensign* (1871); *The Yellow Frigate* (1855). He also wrote *British Battles by Land and Sea* (1873-5), and *Old and New Edinburgh* (1884-7).

Grant, James Augustus (1827-92), Scottish explorer, born at Nairn; after serving through the Indian mutiny, and being wounded at Lucknow, he accompanied (1861) Speke to Africa. This journey, in which he discovered the headwaters of the Nile, is described in *A Walk Across Africa* (1864). He also served in the Intelligence Department under Lord Napier of Magdala in Abyssinia (1868).

Grant, Sir James Hope (1808-75), British general, was born at Kilgraston, Perthshire. He served against the Chinese (1840-2), the

Sikhs (1845-6 and 1848-9), and was present at Sobraon, Chilianwala, and Gujarat. He took a leading part in the suppression of the mutiny, in which he commanded a cavalry brigade, and subsequently a column of all arms. In 1860-1 he commanded the expedition against China, captured the Taku forts, and compelled Peking to surrender. It was he who invented the war game, and in 1871 initiated the British autumn manoeuvres. He wrote *Incidents in the China War* (1875), and *Incidents in the Sepoy War* (1873).

Grant, Sir John Peter (1807-93), British administrator, born in London; entered the Bengal civil service (1828); was permanent secretary in the Home Department of the Indian government (1853), lieutenant-governor of the Central Provinces (1857-59), and of Bengal (1859-62). As a member of the Council (1854-59), he advocated the annexation of Oudh, the legalization of the remarriage of Hindu widows, and showed remarkable tact and capacity during the indigo riots of 1861. He served as governor of Jamaica for seven years (1866-73).

Grant, Sir Patrick (1804-95), British field-marshal, was born at Auchterblair, Inverness-shire; served in Oudh (1834-8) and in Kohat in 1851 under Sir Charles Napier; was present at the battles of Maharajpur, Mudki (where he was wounded), Ferozshah, Sobraon, Chilianwala, and Gujarat, in the Sikh war. As commander of the Indian army, he directed the operations against the mutineers until the arrival of Sir Colin Campbell. He became general in 1870, and field-marshal in 1883.

Grant, Robert (1814-92), Scottish astronomer, was born at Grantown-on-Spey, Morayshire; issued (1852) *A History of Physical Astronomy*, for which he received the gold medal of the Royal Astronomical Society in 1856. Appointed professor of astronomy in Glasgow University (1859), he published a *Catalogue of 6,415 Stars* (1883), and a *Second Catalogue of 2,156 Stars* (1892).

Grant, Ulysses Simpson (1822-85), twice president of the United States. Born in Clermont co., Ohio, he joined the military academy at West Point. In 1846 he had his first experience of active service at Molino del Rey and Chapultepec in the Mexican war. On the outbreak of the civil war in 1861 Grant was first engaged in the adjutant-general's office. His bold attack on Fort Donelson (Feb. 1862), on the Cumberland R., Tennessee, brought him promotion to the rank of major-general of volunteers. His defeat by General A. S. Johnston

at Shiloh (April 1862) was red-deemed by the capture of Vicksburg (1863), when Grant took 31,600 prisoners and drove the Confederates from Mississippi. Congress gave a gold medal to Grant for Vicksburg and Chattanooga, which battle he won against Bragg in the same year. When, on March 10, 1864, Grant was given a free hand as commander-in-chief of the armies of the United States, an end of the war was soon made, for he commenced a series of bloody battles—the Wilderness, Spottsylvania Court-House, Cold Harbor, Appomattox Court-House—with the avowed object of wearing down the Confederates by sheer weight of numbers. Neither the genius of Lee, the Confederate general, nor the valour of his veteran soldiers, could prevail against the masses of Northern troops. In eight months Grant lost 124,000 men; but the policy of 'attrition' triumphed, Lee surrendered, and peace was restored. Grant then became secretary of war (1867-8), and a member of the cabinet of President Johnson; and in March 1869 he was elected eighteenth president of the United States, a position he retained for eight years. Grant's term of office is memorable for the settlement of the Alabama claims by the treaty of Washington. He retired into private life in 1877, failed in business, but gained £100,000 by the publication of his *Personal Memoirs* (1885). He also wrote a large part of *Battles and Leaders of the Civil War* (4 vols. 1887). See *Lives* by W. C. Church (1897) and J. G. Wilson (new ed. 1886).

Grantam, mkt. tn., munic. and parl. bor., Lincolnshire, England, 24 m. s.w. of Lincoln, on the Witham. The ancient church of St. Wulfran has a beautiful 14th century tower and spire 280 ft. high. At the Angel Inn Richard III. signed the death-warrant of Buckingham (1483). The 'George' Hotel, rebuilt in 1780, is described in *Nicholas Nickleby*. There is a bronzestatue of Sir Isaac Newton (who was educated in the town) on St. Peter's Hill. In the vicinity Oliver Cromwell (1643) first defeated a royalist force. Engines of all kinds, electric plant, and agricultural machinery are manufactured. It returns one member to the House of Commons. Pop. (1901) 17,593.

Grantia, the name of a genus of calcareous sponges. The purse sponge (*Grantia compressa*) is common round British shores, and consists of a small colourless sac, attached by the base to rock or weed, and with a large opening at the free end. See SPONGES.

Granton, seapt. and par., Edinburghshire, Scotland, on Firth of Forth, 2 m. w. of Leith. Its harbour was constructed 1835-45. It is the headquarters of the Royal Forth Yacht Club. The trade is largely in coal, grain, and timber. There are timber yards, and motor carriage, printing-ink, and chemical works. Pop. (1901) of ecclesiastical dist. 1,728.

Grantown-on-Spey, bur. and mrkt. tn., Cromdale par., Elginshire, Scotland, 34 m. E.S.E. of Inverness; is a popular health resort. Pop. (1901) 1,568.

Granulations are small conical projections which appear on the surface of an open wound or on the base of an ulcer during the process of repair. They consist of small loops of blood-vessels, and, if healthy, present a bright red surface from which there is an exudation of pus. In the deeper parts of a wound granulations form fibrous tissue, while at the edges epithelium grows in over them, with the result that a scar is formed. This process is sometimes called 'healing by second intention.' Healthy granulations should be gently washed with mild antiseptic lotions, and protected from injury by a covering of gauze soaked in a non-irritating antiseptic over which is placed a layer of gutta-percha tissue, the whole being covered by a pad of cotton wool, and gently but firmly bandaged. When they are weak or flabby, with a watery discharge, they may be stimulated by the application of sulphate of copper or other astringent.

Granulite, originally a rock consisting of quartz, felspar, mica, and garnet. By French geologists it is regarded as synonymous with muscovite granite; German authors, on the other hand, employ it as meaning a schistose or banded metamorphic rock, consisting essentially of minute grains of quartz and felspar, with often also garnet, zircon, mica, kyanite, or sillimanite. These granulites are, as a rule, crushed felspathic igneous masses, though in some cases they have been originally sedimentary. Such granulites are very common in the Scottish Highlands, in Saxony, and in other regions of metamorphic rocks. The 'Moine' schists, which cover a large part of Inverness, Ross, and Sutherland, are biotite granulites.

Granvelle, or **GRANVELLA**, ANTOINE PERRENOT DE (1517-86), ecclesiastic and imperia statesman, was born at Besançon, the son of Charles v.'s imperial chancellor (1530-50), Nicolas Perrenot de Granvelle, and became (1540) bishop of Arras. Henceforth he was the chief political agent of Charles v. against the patriotic

leaders of the Netherlands and the entire Protestant movement. Though raised to the archbishopric of Malines (1560) and made a cardinal (1561), the popular feeling against him grew so strong that he finally withdrew into Franche-Comté. He was then made viceroy of Naples (1570-5), and later president of the Supreme Councils of Italy and Castile successively. He died at Madrid. See *Papiers d'Etat du Cardinal de Granvelle*, ed. by Weiss (9 vols. 1841-52), and the continuation by Pouillet and Piot (9 vols. 1878-92); *Histoire du Cardinal de Granvelle* (anon. 1761).

Granville, fortified seaport and seaside resort, dep. Manche, France, 56 m. S. of Cherbourg. The lower town is built round the harbour. The upper town, anciently fortified, is built on a cliff opposite. There is deep-sea fishing. The town withstood a siege by the Vendéans in 1793, and by the British in 1803. Pop. (1901) 11,667.

Granville, GEORGE LEVESON-GOWER, SECOND EARL (1815-91), English statesman, was born in London. He was elected member for Morpeth (1836); a few years later he became under-secretary for Foreign Affairs in Lord Melbourne's administration (1840-1), and held office in every subsequent Liberal administration until 1886. He was an active promoter of the great exhibition of 1851, and in December of that year was appointed Foreign Secretary, holding that office for a second time in 1870-4, and again in 1880-5. In 1853 he was President of the Council, and from 1868 to 1870 Colonial Secretary. He led the Liberals in the House of Lords for many years. His management of foreign affairs has been characterized as weak, though this may not have been his fault. Lord Granville was probably the best after-dinner speaker of his day, and his command of the French language was unique for an Englishman. See *Life* by Lord Edmond Fitzmaurice (1905).

Grao, or **VILLANUEVA DEL GRAO**, tn., prov. Valencia, Spain, the port of Valencia on the Mediterranean, 2 m. E. of the city. Pop. 6,000.

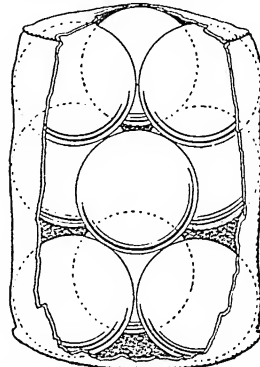
Grape. See **VINE**.

Grape-fruit. See **SHADDOCK**.

Grape - Hyacinth, or **MUSCARI**, a genus of hardy liliaceous plants, very easily grown in ordinary garden soil, and good subjects for naturalization in grass. The flowers are globose and pendulous, and are borne in simple racemes. Most of the species bear blue flowers, though there are white and yellow varieties.

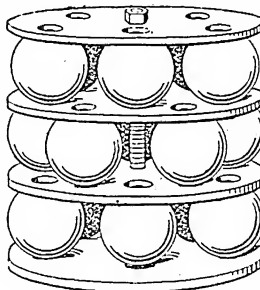
Grapeshot, a composite projectile, consisted of a number of

shot sewn into a canvas bag with pack-thread, the bag being made to fit a gun. A sea-service 42-pounder took nine shot, of 4 lbs. each, in the grape; a 32-pounder, nine shot, of 3 lbs. each; and so on downwards to a 4-pounder, which took nine shot, of 6 oz. each. Caffin's grapeshot (or, more properly, Shrapnel's, 1793) was an improvement on this system.



Grapeshot for old Smooth Bore.

It consisted of three tiers, each generally of three round balls, arranged alternately with four circular plates, the whole being firmly secured by means of a wrought-iron bolt passing through



Grapeshot bolted together.

the centre of the plates, and tightened with a nut. The kind of work formerly done by grapeshot is now done by shrapnel.

Grape Sugar. See **DEXTROSE**.

Graphic, THE, an English (London) weekly illustrated newspaper, was established in December 1869 by W. L. Thomas (d. 1900). It showed enterprise in depicting the incidents of the Franco-German war. It reproduced the masterpieces of both ancient and modern art, and gave commissions to British and foreign artists for such exhibitions as those of 'Types of Beauty' and 'Shakespeare's Heroines.' Among its artistic contributors have been

Sir E. J. Poynter, Luke Fildes, Herkomer, Gregory, Linton, Gilbert, Lady Butler, George du Maurier, and, in later days, Paul Renouard and Phil May. The drawings on which Fildes's picture *The Casuals* and Herkomer's *Chelsea Pensioners* were founded appeared in the *Graphic*, which also gave to the world reproductions in colour of the famous *Cherry Ripe* of Millais and *Flaming June* of Leighton. Among the war artists of the *Graphic* have been Mr. Sydney P. Hall and Mr. Frederic Villiers; and it has numbered among its literary contributors such eminent writers as Charles Reade, Victor Hugo, Sir Walter Besant, J. M. Barrie, Thomas Hardy, William Black, George Meredith, Bret Harte, and Rudyard Kipling. *The Mayor of Casterbridge*, *Tess of the D'Urbervilles*, and *Dorothy Forster* all appeared first as serials in the pages of the *Graphic*.

Graphic Granite consists of quartz and felspar, and occurs in veins proceeding outwards from granite masses. The appearance of a polished slab of this rock is somewhat striking, as the quartz, disseminated through the felspar, resembles the triangular markings of a cuneiform inscription. Graphic granites are also known as pegmatites, though this term is of wider application.

Graphic Statics, the method of solving problems in the distribution of forces, stresses, loads, moments, etc., by means of accurately-drawn figures. In the sequel the capital letters naming a force are placed in the frame diagram on each side of its line of action. In the stress diagram corresponding small letters are placed at the ends of the line denoting each force. The stresses in the members of any framed structure, when in equilibrium under any system of loading, may be determined graphically by an application of the polygon of forces.

A force is completely determined when its direction, magnitude, and point of application are known. Consider the system of equilibrating forces acting at any joint in a framed structure. To commence with, the simplest combination is selected—e.g. one at which there are not more than two unknown quantities. In Fig. 1, a bracket carrying the load BC, there are acting at the point ABC in the frame diagram the three forces AB, BC, CA, of which AB and AC are unknown in magnitude. Set down the load line *bc* parallel to BC, representing it to scale in magnitude, direction, and sense. Draw *ba* and *ca* parallel to BA and CA. Then the stress diagram *abc*, in this case a triangle of forces, corresponds to the joint in the frame dia-

gram ABC. Thus the stresses *ab*, *ac* in AB and AC are found, and are measured by scale. If the frame were part of a

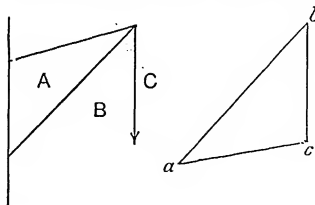


FIG. 1.

large braced structure, we should proceed to the next joint, and in a similar way apply its stress diagram to the previous one, finally obtaining the complete force or stress diagram. (See Figs. 8 and 9.) In Fig. 8 a commencement has been made at the joint KLM, after which the joint 2, or KHG, has been taken. Thus to every line in the frame diagram there is a corresponding parallel in the force diagram, while lines which meet in a point in the one form a closed figure in the other. On account of these relations Clerk Maxwell has named them 'reciprocal figures.'

Funicular Polygon.—In Fig. 2 the forces AB, BC, CD, and DA, acting on the rigid framed body *o*, are in equilibrium. Draw the polygon of forces *abcd*. If any

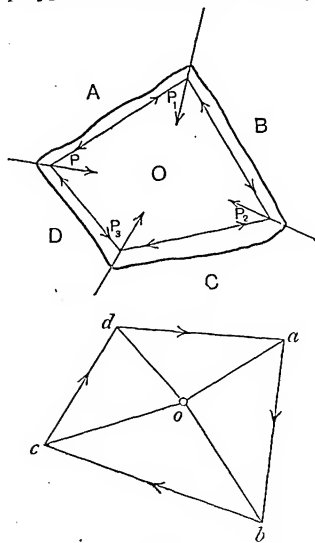


FIG. 2.

'pole' *o* is joined to the vertices of the polygon of forces (*abcd*), and, starting anywhere in the space A corresponding to *a*, *PP* is drawn parallel to *oa*, *P₁P₂* parallel to *ob*, in the space B, and so

on, we obtain an imaginary frame diagram (*PP₁P₂P₃*) called the 'funicular polygon.' This is a closed figure so long as the forces are in equilibrium.

The method for compounding any system of forces acting in one plane is shown in Fig. 3. The magnitude and direction of the resultant (*AE*, *ae*) are given by the polygon of forces, while a point on its line of action is obtained from the funicular polygon. In this case the forces have been drawn parallel, but the same method holds when they are non-parallel. When the forces are parallel, the polygon of forces becomes a straight line, called the 'line of loads.'

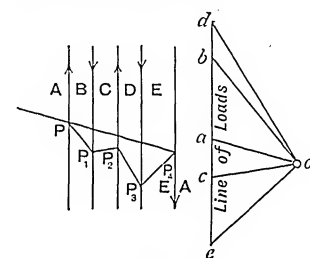


FIG. 3.

Construction:—Draw (noting the directions) the load line *abcde*, also the rays from pole *o*. Draw corresponding sides (*P* to *P₅*) of the funicular polygon, all in their corresponding spaces. Then the intersection *PP₁* and *P₃P₄*, parallels to *oa* and *oc* respectively, the intersection of the initial and closing lines, is a point on the line of action of *EA*, which is thus fully specified, as its magnitude *ae* and sense are got from the line of loads.

Bending Moment and Shearing Force Diagrams.—Fig. 4 shows how to find the bending moment (B.M.) and shearing force (S.F.) at any section of a loaded beam.

Construction:—Draw the stress diagram and funicular polygon. The reactions (*FA* and *DF*) are obtained by drawing of parallel to *PP₁*, the closing line of the funicular polygon. The B.M. at any section of the beam is equal to the resultant moment of all the forces on one side or other of the section. The resultant of all the forces on the left of the section through 5 is *FB*, and a point on its line of action is obtained by producing *P₂P₁* and *P₄P₃* to meet in *Q*. Hence B.M. at 5 is equal to *RFB*, and is negative. It may be shown that this expression is equivalent to *HCY*. Similarly B.M. at any other section (*S*) is given by *H₂Y₁*. In this connection the funicular polygon is usually termed the B.M. diagram. The S.F. at any section of the beam is equal to

the resultant of all the forces acting on one side or other of the section.

Construction:—Project the

thus readily ascertain, in the case of a suspension bridge, the form assumed by the chain and the tension in its numbers when

is called a 'linear arch.' It is, in other words, the frame diagram which, of all those lying within the prescribed limits, is

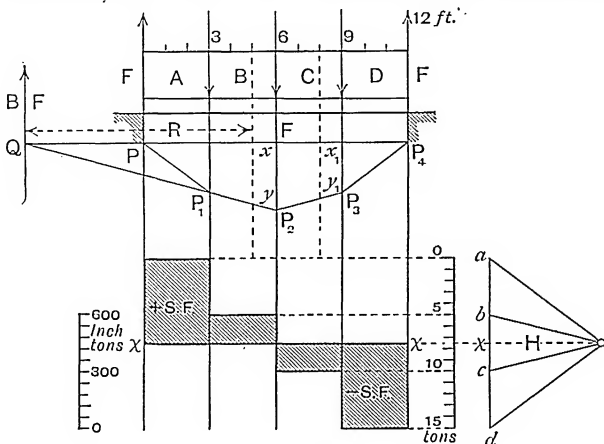


FIG. 4.

loads through their corresponding spaces as shown, drawing FR right across from the one reaction to the other. The hatched figure thus obtained is the S.F. diagram.

Superposition of B.M. and P.F.S.—

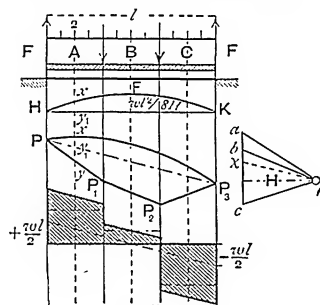


FIG. 5.

The load on a beam may be 'dead or live,' the former being either uniformly distributed or concentrated. Fig. 5 shows how to combine the different B.M. and S.F. diagrams. The load is partly uniform and partly concentrated, the former being w tons per foot run. It can be shown that the B.M. diagram for a uniform load is a parabola with its vertex on the centre line and its height equal to $wl^2/8H$. The S.F. varies as the distance from the centre, being equal to $\pm wl/2$ at the supports.

Suspension Bridge.—Since the funicular polygon for any system of loads is the curve which a chain or rope would assume when similarly loaded, we can

the distribution of the load is given. (See BRIDGE.)

The Linear Arch.—To satisfy the conditions of strength and of stability in the case of the compression ring of a masonry arch, the lines of action of the stresses

under the least horizontal force. Fig. 6 shows one-half of a symmetrically loaded arch ring. It is in equilibrium under the resultant load w , the horizontal pressure H , and the reaction R at the abutment. The maximum and minimum values of H can be found by taking moments about the point where R cuts the abutment; then, assuming values for H between H maximum and H minimum, we may construct a

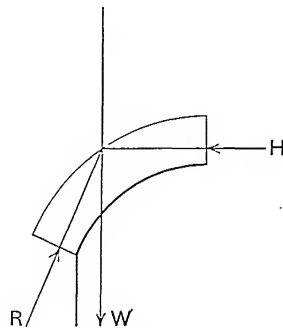


FIG. 6.

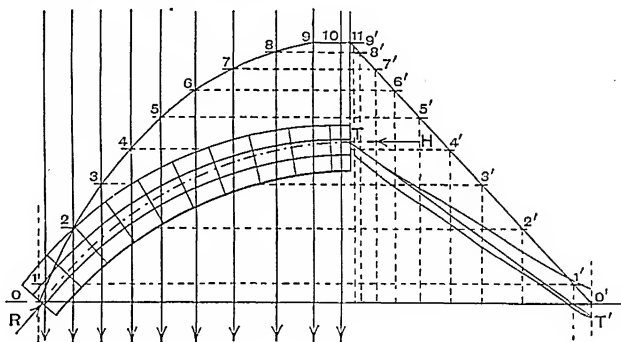


FIG. 7.

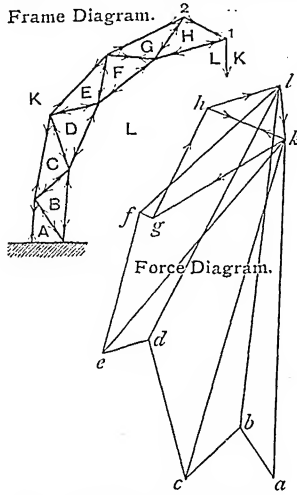
which are called into play by the load must lie within the middle third of each voussoir. (See ARCH.) This imaginary polygon

series of force and frame diagrams till the required linear arch is found.

The following construction (see

Fig. 7), devised by Professor Fuller, is much more expeditious. Assume any value for H , say H_1 .

Frame Diagram.

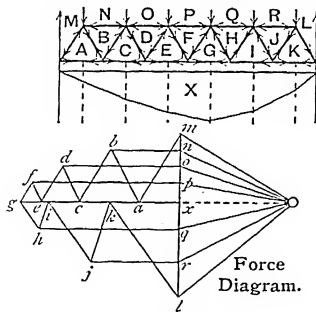


←→ Members in Compression
→ Members in Tension

FIG. 8.

and draw a frame diagram 0, 1, 2, ... 11. On the horizontal through 0 take any point O' and join O' 11. Project the ordinates of the frame diagram on to the line $O' 11$, obtaining the verticals through 1', 2', 3', etc. On these verticals project the intercepts on the corresponding load lines of the middle third of the ring. Join the points so found, forming the irregular figure $T'T$. In this figure the steepest line $T'T$ is to be drawn. Then $T'T$ is to the linear arch as $O' 11$ is to the curve 0, 1, 2, ... 11. Hence, by projecting the ordinates of the line

Frame Diagram.



←→ Members in Compression
→ Members in Tension

FIG. 9.

$T'T$ on to the corresponding load lines, the required linear arch, shown chain-dotted, is obtained. The values of H and R may be

found either by balancing moments or by drawing a second force diagram. The point O' may coincide with 0 or lie to the left of it, and when the load is unsymmetrical, as we must then consider the entire arch, this is the clearer construction. The combined S.F. diagram is similarly constructed by drawing each separately and superposing.

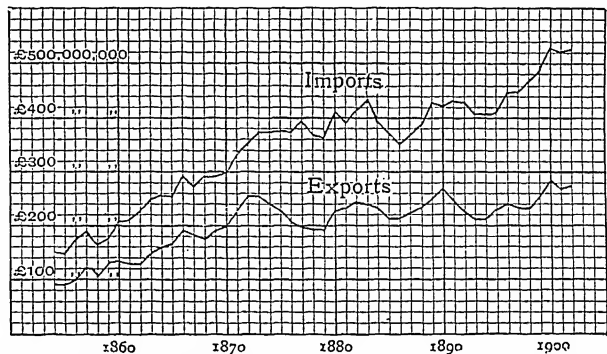
Examples of Reciprocal Figures.

—Figs. 8 and 9 show the frame and force diagrams for the jib of a crane and for a Warren girder.

Construction: — Commencing with joint l (Fig. 8), lk is drawn to represent the known weight LK in direction and magnitude, kh and hl being drawn parallel to KH and HL respectively. The sides of triangle lkh , taken the same way round as lk , give the magnitudes and directions of the stresses KH and HL . Triangle hkg is next constructed for joint 2; but since action and reac-

Graphs, or GRAPHICAL METHODS, in the restricted sense, mean methods which are used in applied science and economics. The object may be simply to show, so as to be evident at a glance, the general manner in which one quantity or quality depends upon or changes with another. Thus, if we mark off along a horizontal line a series of points at equal intervals to represent successive years, and then measure along the vertical line through each point a length representing, say, the population or the values of the exports or imports of a country, we obtain, on drawing a continuous graph through the ends of the measured lengths, a graphical representation of the yearly fluctuations in the population or trade of that country.

Again, we might lay off the number of earthquakes recorded year by year, and so obtain a



Graphical Representation of Exports and Imports of United Kingdom.
(From the Board of Trade Reports.)

tions are equal and opposite, the direction kh must be reversed—i.e. the triangle must be read hky . In a similar manner the other joints are treated, and the stresses in the members obtained. See Gray and Lowson's *Graphical Arithmetic and Graphical Statics* (1888); Cremona's *Graphical Statics* (1890); Culmann's *Die Graphische Statik* (1875); Clarke's *Principles of Graphic Statics* (1888); Bow's *The Economics of Construction in Relation to Framed Structures* (1873).

Graphotype, a temporarily successful but long disused printing process, invented in 1860 by De W. Clinton Hitchcock, an American, as a substitute for wood-engraving. The design was drawn with special ink on compressed French chalk, or its equivalent, the lines being left in relief by brushing away the chalk between them. Electrotypes or stereotypes were then taken from the chalk blocks.

graphical indication of the variations in the seismic activity of a particular region. Rainfall and temperature charts month by month, day by day, or even hour by hour, may be similarly constructed. At the same time it must not be forgotten that the graphical representation is generally not so accurate as the figures upon which it is based.

The method of representing heights on a plane chart by means of contour lines, each of which is a line drawn so as to pass through all points at a particular height, is fundamentally the same graphical method. From a chart in which contour lines are drawn at intervals of height of fifty or a hundred feet a fairly correct idea can be obtained as to the configuration of the land. By colouring the successive intervals a deeper and deeper tint as the height increases cartographers have in recent years greatly increased the scientific value of their maps. On exactly

the same principle lines of equal annual or monthly temperature (isotherms), of equal barometric pressure (isobars), of equal magnetic declination (isogones), and so on, are laid down on maps.

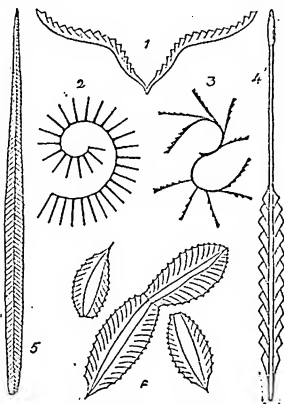
Finally, there is the application of graphical methods in carrying out complicated calculations. The engineer's graphic statics is a familiar example; irregular areas, positions of centres of gravity, and values of moments of inertia may be very conveniently calculated by this means, and give sufficiently accurate values of quantities which are troublesome to calculate by more rigorous mathematical methods.

If the area is laid down fairly accurately on squared paper, we may estimate its value by simply counting the squares included. Or we may divide the area into an even number of parts by means of an odd number of equidistant parallel ordinates, and then combine the lengths of these ordinates by a formula known as 'Simpson's rule'—thus: Add together the extreme ordinates—four times the sum of the even ordinates and twice the sum of the odd ordinates—and multiply the whole sum by one-third the distance between any two ordinates. To find the centre of gravity of the irregular plane figure, divide it into thin parallel strips, multiply the area of each strip by the distance of its centre from any chosen line, add these products together, and divide by the whole area. The result is the distance of the centre of gravity from the chosen line. Do this with reference to another line, and the position of the centre of gravity is found in terms of its two co-ordinates with reference to these lines. The moment of inertia about any line is obtained by multiplying the strip areas marked off parallel to this line by the square of the distances of their respective centres from the line, and adding the whole together.

Grapple Plant (*Harpagophytum procumbens*), a Cape herb with trailing habit, bearing purplish flowers, followed by large fruit.

Graptolites are a group of fossils very characteristic of Silurian rocks. They are mostly preserved as flattened, glancing impressions on the surface of black shales, closely resembling a branch of seaweed or of *Sertularia*. They belong to an extinct order of the Hydrozoa, and were marine animals which floated about, or may in some cases have been anchored to the sea bottom. On one or both sides of a central axial stem rows of minute cup-shaped pockets were mounted. The stem pos-

sessed a stiff 'virgula,' or rod, which sometimes projected freely beyond the end of the branch which bore the pockets in which the polypes lived. The diversity of their forms is astonishing, and a great number of species have been described. Moreover, they were constantly changing; the representative species of one epoch became extinct, and others took their place, to be in turn ousted by a succeeding race.



Types of Graptolites.

1. *Didymograptus v-fractus*. 2. *Rastrites Linnaei*. 3. *Ctenograptus gracilis*. 4. *Climacograptus typicalis* (Monopropiidae). 5. *Retiolites Geinitzi* (Retiolitidae). 6. *Phyllograptus typus* (Diprionidae).

Graptophyllum, a genus of tropical Australasian shrubs belonging to the order Acanthaceae. They are evergreen, and bear brilliant red flowers, and are easy of cultivation in a peaty soil under glass.

Gras, FÉLIX (1844–1901), Provençal writer, was born at Malemort, dep. Vacluse. On the appearance of his first wild mountain epic, *Li Carbounié* (1876), he was at once recognized as the leader of the younger *félibres*. The fiery *geste* of *Tolosa* (1882) deals with Simon de Montfort and the Albigenes. The fine collection of ballads celebrating southern French traditions, *Lou Roumancero Provençal* (1887), was followed by a charming series of prose tales, bringing to life again the old Avignon days (*Li Papalino*, 1891). Gras next devoted three longer tales to subjects connected with the revolution; these have been well translated into English by Catherine A. Janvier—*The Reds of the Midi* (1896); *The Terror* (1898); *The White Terror* (1899).

Graslitz, tn., Bohemia, Austria, 33 m. by rail N.E. of Eger; manufactures lace, embroidery, cottons, musical instruments, mother-of-pearl goods, etc. Pop. (1900) 11,803.

Grasmere, small but charming lake or tarn in Westmorland, England, between Thirlmere and Windermere, drained to the latter through Rydal Water by the Rothay. Length, nearly 1 m. North of the lake is Grasmere village, with its ancient church of St. Oswald, described by Wordsworth in the *Excursion*. In the churchyard lie the remains of the poet, his daughter, his sister Dorothy, and Hartley Coleridge. In Town End, to the S.E., resided Wordsworth, and later De Quincey. Pop. (1901) 781.

Grass Cloth, a material resembling linen, made in China and the East from fibres of various plants of the nettle order. See *BÖHMERIA*.

Grasse, tn., dep. Alpes-Maritimes, France, 18 m. S.W. of Nice; lies at 1,070 ft. alt., sheltered from the north cold wind and open to the south. The town has a parish church of the 12th and 13th centuries, and manufactures essences and perfumes and almond and olive oil. Pop. of comm. (1901) 15,429.

Gräse, JOHANN GEORG THEODOR (1814–85), German literary historian, born at Grimma in Saxony; spent his life at Dresden, where he held the posts of royal librarian, head of the museum of porcelain, and others, retiring in 1882. His *Lehrbuch einer allgemeinen Litterärge-schichte aller bekannten Völker der Welt* (1837–60) is a monument of scholarlike labour. Among his other works are a translation of the *Gesta Romanorum* (1842); *Beiträge zur Litteratur und Sage des Mittelalters* (1850); *Sagenschatz des Königreich Sachsen* (1855); *Handbuch der alten Numismatik* (1853); *Nord und Süd*, a collection of fairy tales (1858); and handbook on pottery and *objets d'art*.

Grasses, THE (order Gramineae), are the most important of the products of the vegetable kingdom, forming the food of all herbivorous animals and including the various cereals on which man subsists. Grasses are monocotyledonous plants having leaves with parallel veins and the parts of the flower in threes or sixes. The inflorescence is spike-like or panicle-like, made up of an aggregation of secondary flowers or spikelets, each spikelet being surrounded by bracts or glumes, which are often prolonged into awns. The stems have hollow internodes.

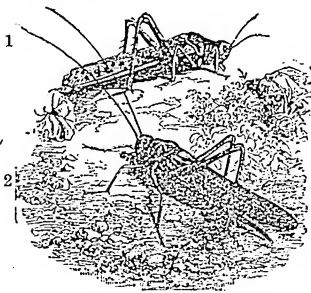
GRASSES, AGRICULTURAL. The most elaborate work on grasses in English is that known as *Hortus Gramineus Woburnensis*, by George Sinclair (1816). Richard Farnell contributed a beautiful book on *The Grasses of Scotland* (1842–5); and Sowerby's *Grasses* (1857) is also a standard

work. In the third edition of Sinclair's book 1,500 distinct species are enumerated; but for purposes of practical agriculture the number of species may be reduced to about a dozen, or even fewer. Thus, in Messrs. Hunter of Chester's treatise on *Permanent Pastures* few of the mixtures recommended contain more than from six to eight species, the remaining constituents being clovers and other kinds of herbage. All grasses either flower on a spike upon the same model as wheat (*Triticum*), or upon a panicle—i.e. on the same general plan as oats (*Avena*). Some are awned or bearded like barley (*Hordeum*), while others are awnless.

Species Flowering on Spikes.—These include the genera *Phleum*, *Alopecurus*, *Cynosurus*, *Triticum*, *Hordeum*, *Lolium*, and *Anthoxanthum*. *Phleum pratense*, or cat's-tail, known also as timothy grass, is a most useful ingredient in almost all mixtures of seeds for more than one year's duration. The seed is small, silvery, lenticular, and cheap. *Alopecurus pratensis*, or meadow fox-tail, may be distinguished by its softer and silkier spike and its awned and ciliated seed. The seed is, however, expensive, and slow in germinating, and is sometimes adulterated with *Alopecurus agrestis*, a worthless weed, and *Holcus lanatus*, or Yorkshire fog, which also bears a bad reputation. *Cynosurus cristatus*, or crested dog's-tail, generally grows as a dense tuft, and is a good late grass. The spike is composed of comblike spikelets, which give it a crested appearance. The seeds are small, and are only added in small quantity to mixtures. *Lolium perenne*, or rye-grass, is more generally used than any other grass. The spikelets are arranged alternately on either side of the rachis on the same plane (flat). The herbage is glossy, and the stem red near the roots. The seeds are oblong, free from awn or down, are safe in germinating, and cheap to buy. *Lolium italicum*, or Italian rye-grass, is distinguished by its awned seeds, and its broader and robust foliage. It is the best grass for sewage irrigation, and if well manured will produce very bulky crops. It is often adulterated with the seeds of *Bromus mollis* ('lop' or 'bobs') and *Triticum repens*, or common couch grass. *Anthoxanthum odoratum*, or sweet vernal grass, is easily recognized by its pyramidal spike and bold florets arranged conically around the rachis. It is often adulterated with the worthless annual *A. pulchellii*. The seeds of *A. odoratum* are almost black, while those of *A. pulchellii* are brown.

Species Flowering in Panicles.

—This class includes the genera *Festuca*, *Poa*, *Dactylis*, *Elymus*, *Agrostis*, *Avena*, and many others. The *Fescues* and *Poas* resemble each other, but the former may be distinguished by the awned florets and harsher imbricated nature of the spikelets, as contrasted with the awnless and globose structure of the florets of *Poa*. Among the most esteemed of these two allied genera may be mentioned *F. elatior*, or tall fescue; *F. duriuscula*, hard fescue; *F. rubra*, red fescue; *F. ovina*, sheep fescue; *F. ovina tenuifolia*, fine-leaved sheep fescue; *F. pratensis*, meadow fescue; and *F. heterophylla*, various-leaved fescue. The *Poas* are generally known as the meadow grasses, and include *P. pratensis*, smooth-stalked meadow-grass; and *P. trivialis*, rough-stalked meadow-grass. *Dactylis glomerata*, or cock's foot, is one of the commonest of all the grasses. It has large globose masses of florets, broad glaucous foliage, and tufted coarse growth. Some authorities consider it to be of great value for pasturage; but no one approves of it as hay, on account of its very coarse stems. It forms a part of all rich pastures, and grows abundantly under trees, hence the name 'orchard-grass.' The only valuable grass in *Avena* is *A. flavescens*, or yellow oat-grass, easily identified when in full flower by its golden yellow appearance. Of *Agrostis* only one species, *A. stolonifera latifolia*, or florin grass, is cultivated—e.g. in the irrigated meadows of Craigentinny, near Edinburgh. *Bromus Schraderi* and *B. erectus* are fairly useful.



Grasshopper.

1. Migratory locust (*A. migratorium*).
2. Great green grasshopper (*L. viridissima*).

Grasshopper, members of two distinct families of orthopterous insects, the Acridiidae, and the Locustidae or green grasshoppers. The locusts of common language, which are true grasshoppers, belong to the former family, and not, as might be expected, to the Locustidae of naturalists. But

while the true or acridean grasshoppers have short antennae, no ovipositor in the female, and feet or tarsi with three joints, the green grasshoppers of the family Locustidae have a conspicuous ovipositor in the female, very long antennae, and tarsi with four joints. In both families the last pair of legs is very long and strong, giving the insects their jumping power. The members of both families are vegetarian in diet, and a green or brown colour is very frequent in both. It is the male only which in most cases produces the chirping noise. In the Acridiidae the upper wings have projecting veins, one of which has a sharp edge, and the inner side of the femur of the leg has a series of little prominences. The wing is scraped against the femur, and so produces the sound. In the Locustidae the sound is produced by scraping one wing against the other. The British acrideans are of small size, and mostly belong to the genera *Stenobothrus* and *Gomphoceris*. The Locustidae as a whole require a warmer climate than that of Britain, and those which occur within the area are limited to the south. The large *Locusta viridissima*, so common in parts of the Continent, is found in certain districts of southern England.

Grassmann, HERMANN GUNTHER (1809-77), German mathematician and Sanskrit scholar, born at Stettin; taught mathematics at the Gymnasium of Cologne. His mathematical work, *Die Wissenschaft der extensiven Größen oder die Ausdehnungslehre* (1844), was only justly valued in its time. His principal philological works are the *Wörterbuch zum Rig-Veda* (1875), and *Uebersetzung des Rig-Veda* (1876-77). He is celebrated as the discoverer (1863) of a linguistic law called 'Grassmann's law,' that in words having two aspirated mutes only one tended to retain its aspirate; the law applies to the Indo-Germanic family. See *Life* by Schlegel (1878).

Grass-moth, a small moth of the family Crambidae, whose caterpillar feeds on grass, while the imago flies about among the vegetation of fields and pastures. Many species belong to the genus *Crambus*, whose members are often called 'veneers.'

Grass of Parnassus (*Parnassia palustris*), a British bog plant belonging to the order Droseraceae. It has smooth leaves, and bears in autumn pale yellow flowers marked with pronounced veins. There are five sepals, five petals, and five stamens, with five fringed scales between.

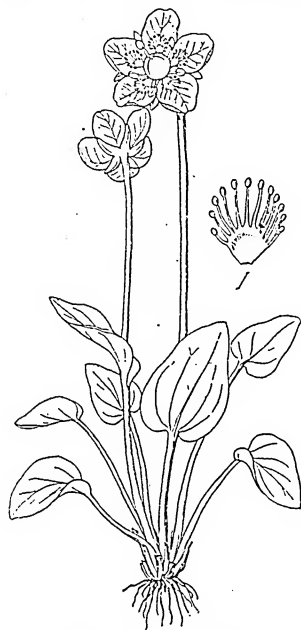
Grass Snake (*Tropidonotus natrix*), a non-poisonous colubrine snake widely distributed



Common Agricultural Grasses.

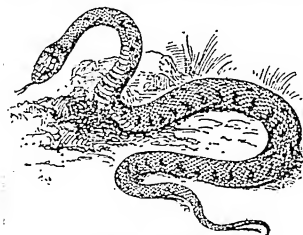
1. *Aira caespitosa*. 2. *Dactylis glomerata*. 3. *Nardus stricta*. 4. *Elymus geniculatus*. 5. *Holcus mollis*. 6. *Festuca elatior*. 7. *Agrostis canina*. 8. *Briza media*. 9. *Cynosura cristata*. 10. *Poa pratensis*. 11. *Avena favescent*. 12. *Bromus mollis*. 13. *Anthoxanthum odoratum*. 14. *Phleum pratense*. 15. *Hordeum pratense*. 16. *Alopecurus pratensis*. 17. *Lolium perenne*. 18. *Triticum repens*.

over Europe, Asia, and N. Africa, but absent from the more northern parts of its range: for example, it does not extend into Scotland, though common in parts of England. The colour is olive-gray



Grass of Parnassus.
1. Fringed scale.

or brown above, with black bands and spots, and checkered black and white beneath. The usual length is three feet, but specimens of six feet have been described. From the much smaller common viper or adder the grass snake may be distinguished by the absence of the zigzag black line down the back. It haunts moist places, feeding on Amphibia, especially frogs and fish. The soft eggs are about one inch long, and are laid in manure heaps, in rich soil, or on heaps of weeds. When attacked the



Grass Snake.

grass snake hisses and strikes out with its head; but it does not bite, and the chief weapon of offence are the 'stink-glands.'

Grass-tree, a name given to various Australian plants belonging to the genus *Xanthorrhoea*, a subdivision of the order Juncaceæ. They bear leaves in a tuft at the summit of the woody stem or caudex, and a spike of white sessile flowers in April. On account of the resin which exudes from some of the species they are known as 'grass gum-trees.' In Britain they are sometimes grown under glass in a peaty soil.

Grassum, a term of Scots law corresponding to the English word 'fine.' It consists of a gross or slump sum paid as part of the consideration for the grant or renewal of a lease. An absolute owner can, of course, take grassums if he pleases; but a limited owner, such as a liferenter, is prohibited from accepting a grassum, as to do so would be to forestall rent which might belong to a successor.

Grass-wrack (*Zostera marina*), a submerged British seaplant with grasslike, bright green leaves, and bearing in late summer flowers composed of stamens and pistils alternately arranged like rows of beads in a long sheath.

Gratiæ, the Graces. See CHARITES.

Gratian, or GRATIANUS, FRANCISCUS, Camaludensian monk and founder of the science of canon law, born at Chiusi in Tuscany, towards the close of the 11th century; first collected the *Decretum*, or the canons issued by popes and councils, at Bologna about 1140. A revised edition of it forms the first part of the *Corpus Juris Canonici*.

Gratianus, AUGUSTUS (359-383 A.D.), emperor of Rome, was the son of the Emperor Valentinian. On the sudden death of his father in 375 he succeeded to the throne; but the army elected his half-brother, Valentinian II., a child of only four years of age, to a share in the empire. Gratian and he only ruled the West, Valens I. being emperor of the East. During his reign hostilities were carried on against the Goths and other invaders, in which Valens fell (378). Gratian then took Theodosius I. as his colleague. In 383 Maximus was proclaimed emperor by the troops in Britain, and defeated Gratian near Paris; the latter fled towards Italy, but was overtaken near Lyons and killed.

Gratiola, a genus of hardy plants belonging to the order Scrophulariaceæ. Some species are worthy of garden cultivation, and some species of *Gratiola*, or 'hedge-hyssop,' were formerly reputed to have medicinal value.

Gratry, ALPHONSE (1805-72), French Roman Catholic theologian, born at Lille; became in

1863 professor of moral philosophy at the Sorbonne. He published a *Cours de Philosophie* (1855-7); *Philosophie du Crêdo* (1861); a commentary on *St. Matthew* (1863-5); and *La Morale et la Loi de l'Histoire* (1868), in which he upheld the principles of the French revolution. He was elected (1867) a member of the French Academy. His *Souvenirs de ma Jeunesse* appeared posthumously (1876). See *Life* by Cardinal Perraud (1900), and by Chauvain (1901).

Grattan, HENRY (1746-1820), Irish politician and patriot, born in Dublin; was called to the Irish bar in 1772, and three years later was returned as representative of Charlemont. Espousing the cause of Irish independence, he joined the Opposition, and was instrumental in obtaining (1779) the removal of the vexatious restrictions on Irish commerce which had existed since the reign of William III. Grattan became so popular that a vote of £50,000 was made to him. He opposed Flood's endeavour to obtain the repeal of Act 6 of George I., coupled with a special act declaring the exclusive right of the Irish Parliament to frame laws for Ireland. Grattan argued the sufficiency of the repeal of the act itself, without a special act, and he fell into discredit for a time. His prestige was restored when he opposed what are known as Orde's propositions, one of which, had it been adopted, would have made Irish commerce liable to regulation by the British Parliament. He obtained a public declaration by the Whig Club of Dublin towards supporting measures for ministerial responsibility and the purity of elections. His popularity was further increased by a measure to get rid of tithes; but this he was unable to pass. As a staunch friend of religious liberty, he espoused the cause of Catholic emancipation, and thereby offended his constituency. Unable to stem the movement which ended in the rebellion of 1798, he retired from Parliament. He was, however, afterwards returned for Wicklow to oppose the union; but that being carried, he entered the Imperial Parliament first (1805) for Malton in Yorkshire, then (1806) for Dublin, and championed the principles of toleration and popular government. He died in London, and is buried in Westminster Abbey. His honesty and consistency are above impeachment, while his private virtues were as conspicuous as his public. His *Speeches* (4 vols.) and his *Miscellaneous Works* were both published by his son (1822). See *Lives* by his son, Henry Grattan (5 vols. 1839-46), and R. Dunlop (1889).

Gratuitous Deed, in Scots law a deed granted without any consideration or value being received for it. It corresponds to the English voluntary deed.

Grätz. See GRAZ.

Grätz, HEINRICH (1817-91), Jewish historian, born at Xions (Posen). In 1854 he became professor in the Jewish theological seminary at Breslau, and in 1870 a professor at the university. His *Geschichte der Juden* (11 vols. 1853-75; trans. by Bella Löwy, 6 vols. 1891-8) is a standard work on the subject. He also wrote *Gnosticismus und Judentum* (1846); *Die Prophetie Joels* (1873); *Kritischer Kommentar zu den Psalmen* (1882); *Emendationes in plerosque sacre Scripture veteris testamenti libros* (1892); and (Eng. trans.) *Influence of Judaism on the Protestant Reformation* (1897). From 1861 Grätz was co-editor with P. J. Frankl of the *Monatschrift für Geschichte und Wissenschaft des Judentums*. See Bloch's *H. Grätz* (1898).

Graudenz, tn., Prussia, prov. West Prussia, stands on r. bk. of the Vistula, 60 m. s. of Danzig. Manufactures machinery, cigars, tapestry, flour, etc. About 1 m. N. is the fortress (dismantled in 1874) constructed by Frederick the Great in 1772-6, and famous for its defence by the Prussians against the French in 1807. Pop. (1900) 32,727.

Graulhet, tn., dep. Tarn, France, 13 m. s.w. of Albi; has tanning. Pop. (1901) 7,900.

Graun, KARL HEINRICH (1701-59), German singer and composer, born at Wahrenbrück in Saxony. He made his début as a tenor at Brunswick. After that he was commissioned to write an opera. This work, *Pollidoro* (1726), and five others, spread his fame over Germany. He was engaged by Frederick the Great for his private chapel at Castle Rheinsberg, and in 1740 was sent to Italy to find singers for a new opera. After his return he was appointed royal musical director, and wrote many operas, of which *Merope* (1756) is the best. His greatest achievement was the oratorio *Der Tod Jesu* (1755), which is still annually performed at Berlin.

Gravel, a deposit of rounded, water-worn stones. Gravels are produced by the action of moving water, usually of streams or of the sea, and are found in all rivers and on seashores. In course of time gravels may become consolidated by cementing agents and by pressure. They then form 'conglomerate,' and such solidified gravel-beds are known among the oldest stratified rocks of the earth's crust. The pebbles in a gravel may consist of any kind of rock. In addition to marine and fluvial gravels, a third

group is often recognized—the glacial gravels. These are partly due to the action of running waters, emerging from the melting ice-sheets and glaciers of the Ice age, and washing out the finer materials from the glacial débris. Such gravels often form terraces, which may be hundreds of feet above the present rivers. With these gravels are often confounded another quite distinct group, the kames or 'eskers,' and also the gravelly morainic matter, mixed with sand and some clay, which have been left behind by glaciers. Gravel is extensively used for making concrete and mortar, and for covering sidewalks and garden paths.

Gravelines, tn., dep. Nord, France, 13 m. N.E. of Calais. The harbour (75 acres) is accessible for vessels of from 600 to 700 tons. It exports salt fish, and has ship-building, flax and hemp spinning, and sugar-refining. In 1558 the French were defeated here by the Spaniards. Off the coast, in 1588, the Spanish Armada was defeated. In 1658 Gravelines was recaptured by the French. Pop. (1901) 6,202.

Gravelotte, vil., 7 m. W. of Metz, in Alsace-Lorraine, Germany, the scene of the most sanguinary battle of the Franco-German war (Aug. 18, 1870), sometimes called the battle of Saint-Privat, which resulted in Bazaine's retreat to Metz.

Gravenhage, 's, Netherlands. See HAGUE, THE.

Graves, ROBERT JAMES (1796-1853), Irish physician, was born in Dublin. Graves reformed many hospital abuses, and introduced the training of medical students by clinical practice in the wards. His *Clinical Lectures* (1848) established his reputation. In reference to one of his new curative methods, he suggested as his own epitaph: 'He fed fevers.' He was professor of medicine (1827) in the Irish College of Physicians, and became president in 1843. See Memoir by W. Stokes, prefixed to Graves's *Studies in Physiology and Medicine* (1863).

Graves, SIR THOMAS (?1747-1814), British admiral, served with Mulgrave's Arctic expedition, and later in N. America. He commanded the *Bedford* in the action in Chesapeake Bay in 1781, and in the battles off St. Kitts and off Les Saintes, near Guadalupe, in 1782. In 1783, in command of the *Magicienne*, he fought a most determined action with the French *Sibylle* and another vessel. In 1801 he joined in the expedition to the Baltic as third in command under Hyde Parker and Nelson, and supported Nelson at a critical moment in the face of an equivocal signal from the

commander-in-chief. In 1804 he was actively employed against the French in the East Indies. In the following year he blockaded the French coast, and more particularly the Rochefort squadron, which, however, succeeded in slipping out. In 1812 he reached the rank of admiral.

Graves, THOMAS, FIRST LORD (?1725-1802), British admiral. In 1779 he conducted the operations against the French in Hudson Bay. He was in command in the engagement in the Chesapeake with De Grasse on Sept. 5, 1781. He served as Lord Howe's second in command in the victory of the First of June 1794, becoming admiral the same year.

Graves' Disease. See GOITRE. **Gravesend**, mrkt. tn. and munic. and parl. bor. in Kent, England, 22 m. S.E. of London, on the Thames, opposite Tilbury. Here are Rosherville Gardens, long a resort of holiday-makers. Milton Mount College is an institution for the daughters of Congregational ministers. Gravesend is an important shipping place, a pilot and yacht station. Shrimp-catching employs many persons. Ports in the vicinity guard the approach to London. It returns one member to the House of Commons. Area of parl. bor. 3,141 ac. Pop. (1901) of munic. bor. 27,175; of parl. bor. 39,776.

Gravesia, a genus of Madagascar herbaceous plants belonging to the order Melastomaceæ. They are valued stove plants, and thrive in a light, well-drained soil containing leaf-mould and peat.

Graville St. Honorine, tn., dep. Seine-Inférieure, France; is a residential suburb of Le Havre. There are in the neighbourhood lead and copper mines. Pop. (1901) 12,012.

Gravina, tn. and episc. see of Italy, prov. Bari, 63 m. by rail (*viâ Gioia del Colle*) s.w. of Bari. Above the town stands an ancient castle of the Emperor Frederick II. Pop. (1901) 18,626.

Gravitation. Experience shows us that every portion of matter falls or tends to fall in a vertical line towards the surface of the earth. When bodies rise, like a balloon in air or a cork in water, they do so because they are lighter, bulk for bulk, than the air or water, the denser matter being pulled down more strongly, and so pushing the lighter material up. In virtue of the approximately spherical form of the earth, these vertical lines, when drawn at all points of the earth's surface, will pass very near to the centre of the earth. Hence we conclude that all bodies are acted on by a force directed very approximately to-

wards this centre. Two questions at once demand an answer. (1.) Is this power of attracting small bodies peculiar to the earth, or is it possessed by other masses? (2.) Why should the lines of attraction pass through the earth's centre? These questions were completely answered by Newton in his great generalization known as the law of gravitation, which states that every particle in the universe attracts every other particle with a force which acts in the line joining them, and which is directly proportional to the product of the masses, and inversely proportional to the square of their distance apart. The mathematical deductions from this law were shown by Newton to be in remarkable accord with the observed motions of planets and satellites. Thus he showed that a uniform sphere, every element of which attracts according to the assumed law, would attract all external particles as if the whole mass were condensed at the centre. This proposition enabled him at once to show that the moon's acceleration towards the earth is to the acceleration of a body at the earth's surface inversely as the squares of their respective distances from the earth's centre. Thus it is the same gravitation force which holds the moon in its orbit, and which makes an apple fall to the ground.

Guided by his great generalization, Newton proceeded further, and showed that the three laws of planetary motion deduced by Kepler after laborious calculations are almost exactly what would be satisfied by comparatively small planets revolving round a very massive central body like the sun, if we disregard the mutual actions of the planets. But the law of universal gravitation asserts that every particle attracts every other particle, so that in a complete theory the mutual actions of the planets must not be disregarded. When they are taken into account, the whole theory of gravitation gives a more complete description of the motions of the planetary system than do Kepler's laws, which are simply a first approximation.

Two hundred years of observation and calculation have established more and more completely the sufficiency of Newton's law as a description of the motions of planets, comets, and meteoric stones round the sun, and of the satellites round the planets. Its indications led Adams and Leverrier independently to point out the probable position of an unknown planet. Again, in the cosmic systems known as double stars we have further evidence that this law of force extends

to the visible limits of our universe. Then there are the variable stars, each of which is believed to be a double system—a dark companion intercepting at regular intervals part of the light from the bright component. From the manner in which the varying brightness goes through its periodic changes it is possible to calculate certain elements of the mutual orbit of the two components, and even their mean density.

Many attempts have been made to explain the mechanism of gravitation, but so far with small success. Newton showed that a medium which was rarefied by the presence of dense bodies, and which increased in density with distance from the material bodies, could afford an explanation of attraction; but this simply pushes the difficulty a stage further back, for this influence of matter upon the medium would itself require a mechanical explanation. Lord Kelvin suggested that the required increasing pressure in the medium as the distance from any material particle increased might be dynamically explained on the hypothesis that in the region occupied by each there is a continual creation of an incompressible fluid, which disappears at the same rate at an infinite distance. Karl Pearson has called this the hypothesis of 'squirts.' Le Sage's theory of ultramundane corpuscles seeks to find the explanation of gravitation in the impact of a countless number of very small particles upon the much grosser particles which are supposed to constitute matter. If we assume these ultramundane corpuscles to be moving about with high velocities, and to be able to pass freely through the spaces separating the atoms of the densest matter, then it may be shown that any two portions of matter will shield each other in such a way that more impacts will take place on the sides removed from each other than on the sides opposing each other, and that this will give rise to an attraction inversely as the square of the distance. Clerk Maxwell has discussed this theory in the light of the conservation of energy, and has found it to be insufficient for its purpose. More recently Osborne Reynolds has in an ingenious way developed his properties of dilatancy into a theory of the construction of the universe. He supposes the ultimate substance of the material order of things to consist of an immense number of minute grains packed closely together like grains of sand. Matter, as we know it, is a state of motion or of configuration among these grains, and between separate groups of such states

there are shown to be attractions of the kind required by the law of gravitation. In regard to ultimate theories, of which a few have been indicated, it may be said generally that the dynamical explanation of gravitation, which is, so far as we know, an attraction, is a problem of a higher order of difficulty than the explanation of electric and magnetic forces, in which there are both attraction and repulsion.

Whatever be its origin, the force of gravitation, as it is observed to be, is ultimately the prime source of most of the energy of the solar system. Helmholtz first showed that the high temperature of the sun is the result of the transformation of gravitational energy into heat as the sun gradually contracted from its original widely extended volume to the volume it now has; that this contraction is still going on, developing greater heat; but that at present there may be more heat lost by radiation into space than is gained by the contraction, so that the sun is a cooling body. Now, with comparatively insignificant exceptions, the energy utilized by vegetables and animals is solar. Then, as regards these exceptions, some are obviously gravitational in their origin—such, namely, as arise from the earth's own internal heat, or from the tidal action of the moon. Thus we recognize in gravitation one of the great sources of the various forms of energy whose continual transformations make up the activity of the universe. The one source which at first sight is not gravitational is that which depends upon chemical affinity—that is, upon the intermolecular forces. But Kelvin has shown that these intermolecular forces may be ultimately of the same character as gravitational forces.

Grävius, JOHANN GEORG (1632-1703), German philologist, born at Naumberg, Saxony; obtained the professorship of rhetoric at Duisburg in 1656, another professorship at Deventer in 1658, and finally occupied the chairs of history and rhetoric at Utrecht. He is remembered for his annotated editions of the classics, especially that of Cicero's works, and Lucian, Catullus, Tibullus, and Propertius, also for his *Thesaurus Antiquitatum Romanarum* (1694-9) and *Thesaurus Antiquitatum et Historiarum Italiae*, completed by Burmann (1704-25). See *Lives* by Burmann (1703) and Jacob (1843).

Gravosa, the fortified harbour of Ragusa, in the Austrian prov. of Dalmatia, lies 2 m. N.W. of Ragusa.

Gray, ASA (1810-88), American botanist, born at Paris, New York. In 1842 he accepted the chair of

natural history and botany at Harvard, and held it till 1873, devoting special care to the herbarium (200,000 plants) and the library (2,200 books). With Dr. Torrey he attempted a new and natural classification of plants, and an exhaustive study of N. American flora. *How Plants Grow* (1858) and *How Plants Behave* (1872) display his method and manner. He was an eager exponent and critic of Darwinism. His works include the *Botanical Text-book* (1836, 1839, 1869); *The Flora of N. America* (1838-43), with Dr. Torrey; *Manual of the Botany of the Northern United States* (1847); *Genera Borealia Americana*, illustrated by Sprague (1848-56); *Botany of Japan in Relation to N. America* (1859)—'in point of originality and far-reaching results, his magnum opus,' *Synoptical Flora* (1878).

Gray, DAVID (1838-61), Scottish poet. In 1860 he went with his friend Robert Buchanan to London, but, attacked by consumption, he returned to die at his home at Merkland in Dumbar-tonshire. His volume, *The Luggie, and other Poems* (1862), and especially his sonnets, *In the Shadows*, bear the stamp of genuine though necessarily immature genius. An edition of his works, edited by H. G. Bell, appeared in 1874. See *Memoir by Hedderwick*, prefixed to *The Luggie*; also Buchanan's *David Gray, and other Essays* (1868).

Gray, JOHN EDWARD (1800-75), English naturalist, entered the British Museum as assistant in 1824, and in 1840 succeeded J. G. Children as keeper of the zoological collection. Catalogues of the collections under his care form the major portion of his very numerous scientific productions, though they include also *Illustrations of Indian Zoology* (1830-35), a *Synopsis of British Molluscs* (1852), *Handbook of British Water-weeds* (1864), and *Synopsis of Whales and Dolphins* (1868).

Gray, THOMAS (1716-71), English poet, born in London. He had a friend in Horace Walpole, and went (1739) with him for a continental tour. They quarrelled at Reggio (1741), and Gray went off to Venice, whence he returned to London (1741). The first of Gray's original poems, the *Ode on Spring*, was written before June 1742, and his 'sonnet' of lament for West in August, as were also the *Ode on a Distant Prospect of Eton College* and the *Hymn to Adversity*. Reconciled to Walpole, he sent him (March 1747) the *Ode on the Death of a Favourite Cat*, his friend's *Selima*, and perhaps added a fresh touch to *Agrippina*, which remained, however, only a tragic fragment. Another fragment, *The Alliance*

of *Education and Government*, was in hand in 1748. The *Elegy* he sent to Walpole on June 12, 1750. The churchyard at Stoke Poges and its environs are the scene of this great poem. In 1752 Gray wrote, but did not publish, the *Stanzas to Bentley*, the illustrator of the *Six Poems* of his which were then appearing. At the end of 1754 he finished the *Ode on the Progress of Poesy*, and in 1757 *The Bard*. In 1756 Gray migrated to Pembroke College, which was his home for the rest of his life. Though the two 'Pindaric Odes,' especially *The Bard*, were epoch-making, it was long before they became popular. Gray had begun to study Norse literature, and the fruit of these researches appeared in spirited versions from the sagas—*The Fatal Sisters and Descent of Odin* (1768). In 1768 Gray was appointed to the Cambridge professorship of modern history. Gray was an accomplished classical scholar, and his Latin has the charm of his English verse. He studied with thoroughness both French and Italian literature. He was by temperament melancholy. In the history of our literature no one who published so little holds so high a place. See *Poems* (1768); Mason's *Memoirs, Letters, Poems* (1775), with extracts from MSS. by Mathias (1814); Mitford's *Works, with Life* (4 vols. 1836; vol. v. 1843); Gosse's ed. of *Works* (1884); Gosse's *Life* (1882, 1889); *Gray and His Friends* (1890); *Poems* (ed. Bradshaw, 1891); *English Poems* (Camb. Univ. Press, 1898); *Letters* (Bohn's Series. i. 1900; ii. 1904).

Grayling (*Thymallus vulgaris*), a salmonoid fish found in fresh water in parts of England, and distributed over Europe generally. It is distinguished by the height and breadth of the dorsal fin, which has from thirteen to twenty-three rays. There is another European species, found in Dalmatia, as well as some American forms.

Grayling Butterfly (*Hyparochia semele*), a member of the family Nymphalidae, common in upland regions in Britain. It has the under-surface beautifully mottled with gray, and is a near ally of the meadow-brown (*Euphydryas aurinia*).

Gray's Inn. See INNS OF COURT.

Gray's Peak (14,341 ft.), one of the loftiest summits of the Rocky Mts., Colorado, U.S.A., 46 m. s.s.w. of Denver.

Grays Thurrock, or GRAYS, par. and tn., Essex, England, on l. bk. of the Thames, 3 m. N.W. of Tilbury Fort; trades in lime, cement, bricks, etc. The training-ships *Exmouth* and *Shaftesbury* are moored off the place. Pop. (1901) 13,831.

Graz, or GRATZ (down to 1843, but since then an incorrect spelling), tn. and episc. see of Austria, chief town of prov. Styria, 140 m. by rail s.s.w. of Vienna. Its healthy situation makes it a favourite place of residence for retired Austrian officials. Its manufactures are of machinery, steel and iron ware, soap, chemicals, pottery, confectionery, beer. In addition there are large railway works. The central feature is the Castle Hill, which was fortified down to 1809. There is also a 15th-century cathedral. Graz is the seat of a university (founded in 1586; new building 1890-5), attended by some 1,500 students, and of a polytechnic (1888), with about 400 students. Pop. (1900) 138,080.

Grazalema, tn., prov. Cadiz, Spain, 10 m. from Ronda, on the Sierra de Pinar, at an altitude of 4,200 ft.; has manufactures of cloth, flannel, quilts, shawls, etc. Pop. (1900) 5,587.

Grazzini, ANTONIO FRANCESCO (1503-83), Italian author, wrote several comedies, including *La Gelosia*, *La Spiritata*, *I Parentadi*, *La Pinocchio*, and *L'Arzzyogolo*; also *Le Cene*, a collection of tales on the lines of Boccaccio's *Decameron*. He was one of the founders, in 1540, of the 'Accademia degli Umidì,' and later of the 'Accademia della Crusca,' societies, in which he passed by the name of 'Il Lasca,' his literary pseudonym. See *Vita del Lasca* in Fanfani's edition of Grazzini's prose works (1857). His *Commedie* were issued by the same editor in 1859.

Grease. See LUBRICANTS.

Great Auk. See GARE-FOWL.

Great Barrier Reef, a series of coral reefs extending along the E. of Queensland, Australia, for over 1,300 m., from the N. side of Torres Strait to Cape Sandy, at a distance of from 10 to 150 m. from the coast, but in general from 15 to 20 m. Its foundation represents the old coast-line of Australia. The area has been computed at some 100,000 sq. m. The line is not continuous, the gaps being most numerous in the southern portion, and due chiefly to the fresh water of the rivers, which is unfavourable to the growth of the coral polypes. From N. to S. the entrances from the Pacific Ocean to the calm water between this natural breakwater and the mainland are Bligh, Yule, Olinda, Raine I., Steads, Second 3 Miles, First 3 Miles, Cook's Endeavour, Trinity, Flora, and Flinders. Raine I. entrance is considered best for the purposes of navigation; Bligh, Olinda, and Flinders come next. Pearls and trepang are collected. See W. Saville Kent's *The Great Barrier Reef of Australia* (1893).

Great Barrington, tn., Berkshire co., Massachusetts, U.S.A., on Housatonic R., 40 m. S.E. of Albany; is a popular summer resort. Pop. (1900) 5,854.

Great Basin, inland drainage area of 210,000 sq. m. in the Western United States. It comprises S. Oregon, E. California, nearly all Nevada, and W. Utah. It is limited on the E. by the Wasatch Mts., and on the W. by the Sierra Nevada. Its surface is composed of an alternation of

on irrigated lands, but the region is rich in minerals.

Great Bear Lake. See BEAR LAKE.

Great Belt. See BELT, GREAT.

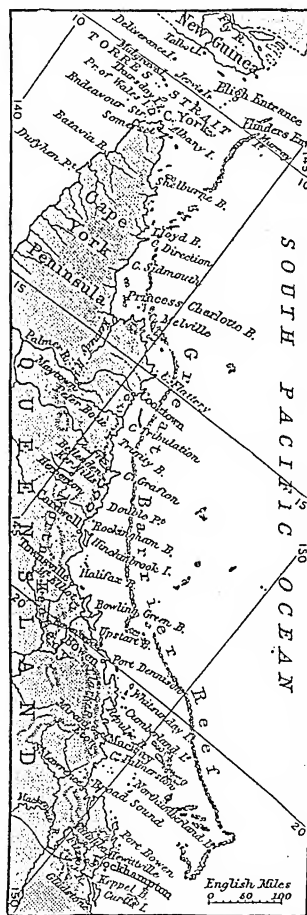
Great Britain, so called to distinguish it from Brittany in France, lies on the continental plateau of Europe, within the 100-fathom line. It is by far the largest island off the shores of the continent, having an area of fully 88,000 sq. m. From France it is separated only by the Strait of Dover, 21 m. across, with depths of from 20 to 30 fathoms, where the latest land connection with the continent existed. The greatest breadth is at the S., from Land's End to the North Foreland, 330 m.; and the length, from Land's End to the most N. point, Dunnet Head, is about 600 m. Between the Solway Firth and the Tyne the island narrows to 60 m., and between the firths of Forth and Clyde to only 32 m. Within these narrow limits is crowded a remarkable variety of rocks, every system of Europe being represented except the Miocene.

North Britain, or Scotland, falls into three natural divisions—the Highlands, the Central Lowlands, and the Southern Uplands. The Highlands are built up of granites, schists, and other ancient rocks, running in bands from N.E. to S.W., and penetrated by deep valleys, the lower parts of which have sunk beneath the sea, forming the numerous long sea-lochs or fiords of the W. coast. Chief of these valleys is the Great Glen, probably on the line of a great dislocation, which divides the Highlands into two parts. The loftiest heights occur in the Grampian range, as the S.E. group is generally called, where several summits rise above 4,000 ft., such as Ben Macdui, Cairntoul, Ben Avon, and Ben Nevis (4,406 ft.), the highest elevation in Great Britain. The Southern Uplands are composed of Silurian rocks, overlaid towards the S. by later Palaeozoic rocks, and rise to heights of from 1,300 to 2,700 ft. Between these masses lie the Lowlands, bounded on the N. by a line from the Firth of Clyde to Stonehaven, and on the S. by a line from Girvan to Dunbar. Sunk between the mountain-masses on the N. and S. the Old Red Sandstone, which at one time covered the whole of Scotland, and Carboniferous rocks, have been preserved. Though the elevation is on the whole low, this part of Scotland is traversed by numerous ridges of hills, as the Sidlaw and Ochil Hills, the Pentlands, and Campsie Fells.

From the Cheviot Hills the backbone of England, the Pennine range, runs S. to the Peak

in Derbyshire. It is a great arch of Carboniferous rocks (Mountain Limestone and Millstone Grit), from which the Coal Measures have been stripped off, but they lie here and there along the foot of the range. The highest point is Cross Fell (2,892 ft.), while several other summits exceed 2,000 ft. in altitude. On the W., separated by the Pennine fault, lies the Lake District of Cumberland and Westmorland, a mass of Silurian rocks surrounded by Carboniferous limestone, in which the valleys radiate from a common centre. Among the highest summits are Scafell Pike (3,210 ft.), the loftiest peak in England, Skiddaw, and Helvellyn. Wales is a mountainous country built up of Cambrian and Silurian rocks, with patches of Coal Measures in synclinal troughs, the largest being the S. Wales coal field, lying in a basin of Old Red Sandstone. The greatest elevations are in N. Wales, where Snowdon in Carnarvonshire rises to 3,560 ft., and Cader Idris attains to 2,927 ft. South Wales is on the whole lower, but the Beacons of Brecon exceed 2,800 ft. The peninsula of Devon and Cornwall is very similar, consisting of Devonian rocks, which are of the same geological horizon as the Old Red Sandstone and Carboniferous rocks. They form table-lands from 1,500 to 1,600 ft. high, as Dartmoor and Exmoor, and culminate in Yes Tor at a height of more than 2,000 ft. Igneous rocks are present in all parts of Scotland, in the Cumbrian mountains, N. Wales, Devonshire, and Cornwall, and form many of the highest peaks—Ben Nevis, Scafell, Snowdon, Cader Idris, and Brent Tor in Devonshire. All these mountains have been formed by denudation, and have been rounded off by the ice of the Glacial period.

Round the extremity of the Pennine range lie Triassic plains, the Cheshire plain between the Pennine range and the Welsh mountains, the plain of York, and the central plain S. of the Peak. The latter are bounded on the S. and E. by the great oolitic escarpment, which, running from the Exe to the mouth of the Tees, divides the Palaeozoic mountains of England from the lower S.E. part of the country, which is formed by Secondary and Tertiary rocks. The hills in this part are of a totally different character, being the prominent sections of the oolitic and chalk escarpments. To the former belong the Blackdown Hills in E. Devonshire, the Cotswolds (about 1,100 ft.), and the moors of Yorkshire (1,500 ft.). To the E. a Jurassic belt crosses England,



The Great Barrier Reef.

narrow ranges trending nearly N. and S., separated by broad detritus-filled valleys. Its elevation ranges from a little below sea-level up to nearly 7,000 ft. in the valleys, while the highest peaks of the mountains reach from 9,000 to 11,000 ft. Great Salt Lake lies on the eastern border, and Walker, Carson, and Owen Lakes on the western. Agriculture within the basin is only possible

bounded on the E. by the chalk escarpment which forms the Dorset and Marlborough Downs, the Chiltern Hills, and the Wolds of Lincolnshire and Yorkshire, terminating at Flamborough Head. From this escarpment the chalk extends to the E. and S. coasts, exhibiting a very uniform surface of dry valleys and grassy hills. In a depression in the chalk lies the clay of the London basin, stretching from Wiltshire along the Kennet and Thames valleys, and through Essex and the E. of Suffolk and Norfolk to Cromer. The same Eocene clay also occurs in the Hampshire basin, cut off from the London basin by the Weald. Here a ridge was formed in the chalk during the latest movements of the land, and not only has the clay been removed, but also the chalk and green-sand from the top of the ridge, leaving the Weald clay exposed. The escarpments form the N. and S. Downs, running through Surrey, Sussex, and Kent, and terminating in the Forelands and Beachy Head respectively.

As the watershed of the island is in most parts nearer the western than the eastern coast, the rivers entering the North Sea are generally the longer. The chief in Scotland are the Spey (107 m. long), flowing from the Highlands to Moray Firth; the Tay (120 m.), navigable to Perth; the Forth (180 m.), rising near Ben Lomond, and navigable to Stirling; and the Tweed (96 m.), rising in the Lowther Hills and debouching at Berwick. In the S. of Scotland the W. coast is further removed from the watershed, and here we find only one considerable river, the Clyde (98 m.), which rises near the Tweed. In England the oolitic escarpment is the watershed, except where it is interrupted by the basin of the Humber. Where the escarpment lies more to the W., the Thames (210 m.), the longest river in Great Britain, rises in the Cotswold Hills. It is navigable by large steamers to the docks of London, 47 m. from the sea. The Humber is the estuary of two large rivers—the Yorkshire Ouse, navigable for small craft to York; and the Trent (150 m.), navigable for small sea-going steamers to Gainsborough. The Great Ouse, entering the Wash, has a length of 150 m., and is navigable to Bedford. The Severn (200 m.), rising on Plinlimmon, in Wales, runs S. to the Bristol Channel, and is navigable by vessels drawing six feet of water up to Stourport. The Dee also rises in Wales, issuing from Lake Bala; it is 77 m. long, but is of little use for navigation, and its estuary is much obstructed by sandbanks. The other rivers

to the N. are comparatively short, being hemmed in by the Pennine range. Lakes are particularly numerous in Scotland, and several of them are far below the sea-level. Loch Ness, 23 m. long, has a depth of 751 ft. (greater, therefore, than the average depth of the North Sea); while Loch Morar descends to 1,017 ft., or about

are the wide Moray Firth, the Firth of Tay, and the Firth of Forth (50 m. long), in Scotland; the Humber, the Wash, and the estuary of the Thames, in England. The S. coast of England has several protected harbours, among them Southampton (protected by the Isle of Wight), Portsmouth, and Plymouth. The



985 ft. below sea-level. Loch Lomond, 21 m. long, is the largest lake in the island (27 sq. m.). In England the only lakes of importance are in Cumberland and Westmorland, the largest being Windermere, with a length of 10½ m. In Wales are Lake Bala, 4 m. long, and a few much smaller lakes. The coasts are less indented on the E. than on the other coasts. The chief inlets

Bristol Channel runs far into the land, and the mouth of the Mersey forms the important port of Liverpool. The W. coast of Scotland is much indented, the Firth of Clyde being an important commercial highway; and innumerable islands lie off the coasts, the Inner and Outer Hebrides, the higher points of the submerged continental plateau. Off the English coasts there are

only three islands deserving special mention—the Isle of Man, Anglesea, and the Isle of Wight.

The most important minerals of Great Britain are coal and iron. Coal occurs in the Carboniferous beds of the Scottish Lowlands, from the coast of Ayrshire to the Kirth of Forth; in the coal field of Durham and Northumberland; on the w. flank of the Pennine range, between the Aire and Trent; on the E. flank in Lancashire; in Staffordshire, where the measures lie in basins of the Trias; in N. and S. Wales; and it has been found below the chalk near Dover. Iron also occurs in most of the coal fields; the red hematite ore of Cumberland is particularly rich in iron. Tin is worked in Devonshire and Cornwall, and most of the copper ore is obtained in these counties, though there are also mines in N. Wales, Lancashire, and the Isle of Man. Lead and silver are extracted in the northern counties of England, the Lead Hills in Scotland, in Wales, and in the Isle of Man. Zinc comes from the Isle of Man, N. Wales, and Cumberland. In the year 1905, 236,128,936 tons of coal were extracted from the mines of the United Kingdom, and the quantities of metal obtained from British ores (1904) were as follows:—

Pig iron . . .	4,524,412 tons
Fine copper . . .	493 "
Metallic lead . .	19,838 "
White tin . . .	4,132 "
Zinc	10,263 "
Silver (from lead ore)	159,689 oz.

The aggregate value of the metallic ores extracted was (1904) £14,348,890, and of the coal (1905) £82,038,553. Preliminary reports for 1905 give the total output of minerals from mines (excluding 'quarries') as 253,223,899 tons, of which 236,128,936 tons were coal, 7,860,969 tons ironstone, 2,851,418 tons fire-clay, 2,496,567 tons oil shale, and 1,768,744 tons were iron ore. Arsenic, manganese, gold, nickel, fluorspar, and wolfram are also raised, besides building-stones of various kinds, china-clay, and fire-clay.

Owing to its insular character and its proximity to the Atlantic Ocean, Great Britain enjoys a more equable climate than the neighbouring countries of the continent. The annual mean for Greenwich, 50°, is only one degree less than that of Paris, while the difference between the warmest and coldest months is 26°, or 3° less than at Paris. Between Falmouth in Cornwall and the Orkneys, about 9° of latitude apart, there is a temperature difference of fully 6°. The isotherms run on the whole

N.W., showing the effect of the warm winds from the Atlantic, S.W. winds prevailing, except in April and May, when N.E. winds are frequent. During the cold months the isotherms bend still more to the N., and in the warm months they trend nearly W. Consequently the temperature on the W. coast is higher than at places in the same latitude on the E. coast. This is especially the case with the W. coast of Scotland, where the isotherm for the year runs almost in a N. direction. As the S.W. winds and the height of the land are the chief factors determining the rainfall, the W. side of the island receives more rain than the E. Nearly half of England and some considerable areas on the E. coast of Scotland receive less than 30 in.; while in the W. of Scotland, parts of Cumberland, Westmorland, and Lancashire, Devon and Cornwall, the fall is 60 in.; and in certain areas of the Highlands, Skye, Wales, and the Lake District, it exceeds 80 in. At Glen-croce, Argyllshire, 128 in. fall in the year, and at the Styce pass in Cumberland 186 in. The S. coast of England has an exceptionally agreeable and salubrious winter climate.

The fauna is in general that of the Palearctic region, but as Great Britain was finally separated from the continent towards the close of the Glacial period, the species are less numerous than on the continent. Britain contains only 40 species of land mammals, while Germany has 90, and Scandinavia 60, and 13 species of reptiles and amphibia, while Belgium has 22. Some have become extinct within historic times, as the bear, wolf, wild boar, and beaver, the capercaillie and the great bustard. One bird at least, the red grouse of Scotland (*Lagopus scoticus*), is a distinct species, and several species of trout, char, etc., are peculiar to Great Britain. Of insects there are many peculiar species and varieties. The only large wild animals are the red deer in Scotland and Exmoor, the fallow deer, and one or two herds of wild cattle preserved in private parks. The fox, hare, the rabbit, and squirrel are found everywhere; the badger and otter are becoming rare.

The flora also is on the whole of a European type, and consists of about 1,500 species of flowering plants, and perhaps twice as many cryptogams. Still, there are several non-European forms, of which three are American species. The chief indigenous trees are the oak and beech, and the Scotch fir and birch on the higher grounds and in the north. Alpine forms occur in the higher parts of the mountains. Dairy-

farming flourishes most in the central plain and Cheshire, grazing in Yorkshire and Scotland. The Highlands of Scotland, the Lake District, and part of Wales consist to a large extent of bare hills, which at most offer here and there scanty pasturage for sheep or deer, and valleys where a few cattle can graze. Forests, formerly extensive, now cover only four per cent. of the surface. The total population of Great Britain is (1901) 36,999,946. See Ramsay's *The Physical Geology and Geography of Great Britain* (1894); Jukes-Brown's *The Building of the British Isles* (1892); Buchan's 'Rainfall of the British Isles,' and 'Mean Atmospheric Pressure and Temperature of the British Islands,' in *Jour. of Scot. Meteor. Soc.* (1885, 1896); Wallace's *Island Life* (1892); Turnbull's *Index of British Plants* (1889).

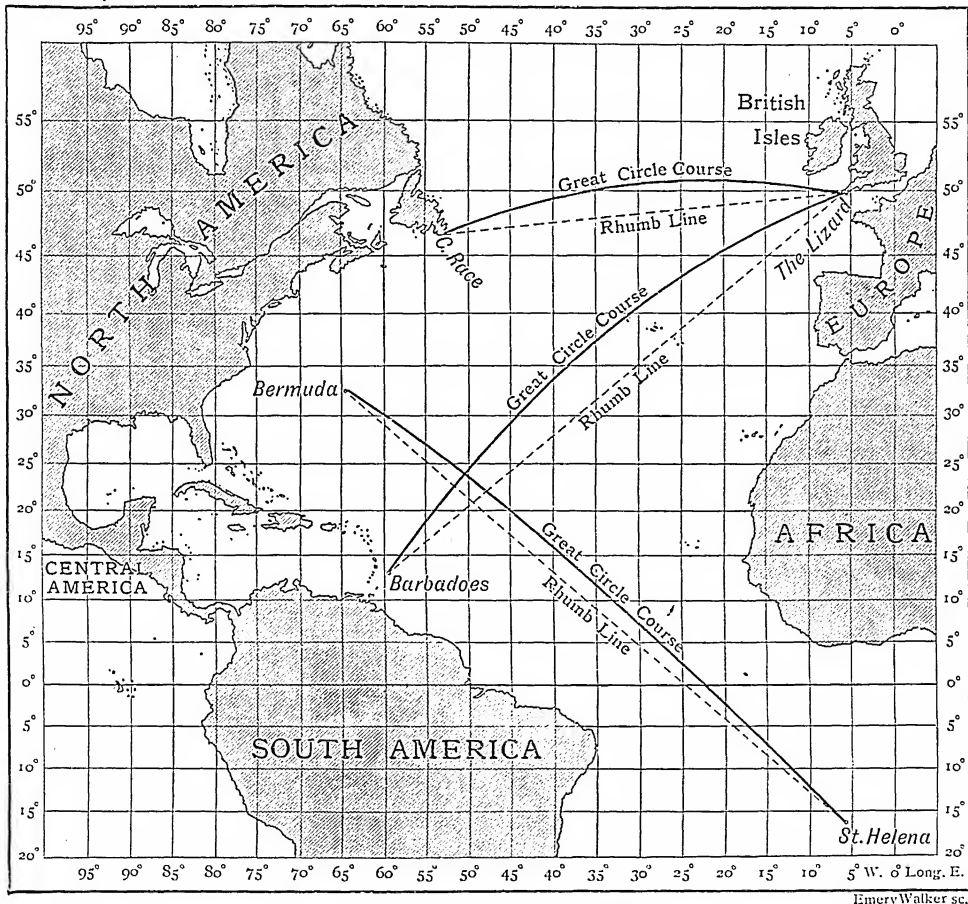
Great Central Railway. Britain, was established in 1849, and until 1897 was known as the Manchester, Sheffield, and Lincolnshire Railway. In 1897 an extension was constructed from Annesley in Notts to Quainton Road (98 m.) in Bucks, thus enabling the company to bring its line into London *via* the Metropolitan Railway system. Paid-up capital is £46,633,974. Gross receipts for the year 1905 amounted to £3,853,755. Gross expenses were £2,549,071. No dividend has been paid since the end of 1898 on any of the preference stocks issued since 1881. The total length of the system amounts to 753 m. The head office is at Marylebone Station, London, N.W.

Great Circle Sailing. A 'great circle' on the surface of a sphere is a circle the centre of which coincides with the centre of the sphere. The equator and the meridian and ecliptic circles are 'great circles' on the globe. The shortest distance between any two points on the surface of a sphere lies along the arc of a great circle which passes through the places. Unless both places be on the equator, or on the same meridian, such a great circle cuts the successive meridians at varying angles, so that its compass-bearing is continually changing. If such a course along a great circle be plotted out on a chart on Mercator's projection, it will be found that the course is represented by a line which curves to the polar side of the rhumb line, or the straight line joining the two places on the chart. That point of the curve which is nearest to the pole is called the 'vertex,' and that which is farthest from the rhumb line is called the 'point of maximum separation.' The method by which a vessel is navigated along the arc of a great circle

is called 'great circle sailing.' It was known to John Davis, who mentions it in his *Seaman's Secrets* (1594), but gives no particulars. In 1847 Towson published a linear index and tables, by the use of which a great circle course could be drawn correctly on an ordinary Mercator chart; in 1858 Godfray published charts on the gnomonic projection, on which the great

of modern azimuth tables in a way suggested by Mr. Goodwin in 1894, and popularized in Captain Lecky's *Wrinkles in Practical Navigation* (14th ed. 1903). It may be roughly described as follows:—The great circle course is that on which a vessel sails straight for her distant port, and which she would steer if kept heading for a heavenly body stationed directly above it. There

in theory its service would be greatest, in practice it would take the vessel into tempestuous regions and among the polar ice. To meet such cases, which include the voyage round the Cape of Good Hope to Australia, and the voyage thence to Cape Horn, Towson in 1858 proposed what is called 'composite great circle sailing,' the composite course being a great circle course modi-



Examples of Great Circle Courses.

Emery Walker sc.

circle between two places is represented by a straight line, to be plotted out afterwards on the Mercator chart; in the same year Sir G. Airy brought out a method by which, with the aid of a simple table and mathematical drawing, the great circle course could be drawn directly on a Mercator chart with approximate accuracy; and Captain Bergen's great circle charts (1880) are also deserving of mention. Hardly less important is the use

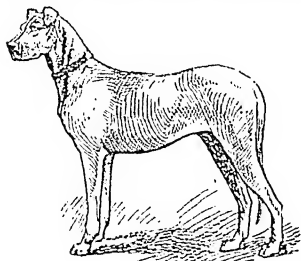
is no such heavenly body, but the navigator acts as if there were, and, ascertaining from his tables what would be its bearing, takes that for his course, setting it anew from time to time as the azimuth alters with his change of position.

Besides being the shortest track between two points, the great circle course, as already said, differs from the rhumb line in that it lies nearer the pole. And thus, in high latitudes, where

is so as to touch the highest desired parallel without crossing it. See J. T. Towson's *Tables for Reduction of Ex-Meridian Altitudes* (6th ed. 1856); Evers's *Navigation and Great Circle Sailing* (1859).

Great Dane, THE, a dog which has at different times been called the 'boar-hound,' the 'German mastiff,' and the 'Ulmer dog.' The first specimen seen in England was a savage brute, named Satan, about 1870. The grand

figure, the bold outlook, and the commanding appearance of the type commended it to certain enthusiasts; and when it was found to be faithful, and intelligent,



Great Dane.

and of unfailing courage, it soon came into favour, and by 1884 a class was provided for Great Danes at the Birmingham dog show. The latest development of the breed is a harlequin-coloured or black and white dog, sometimes with a wall eye and mottled nose. The Great Dane stands 34 in. high, and weighs as much as 180 lbs.; though the bitch is considerably smaller and lighter. Since the abolition of cropping the ears by the Kennel Club, the Great Dane has suffered in appearance; for his ears are heavy, and require cropping to give him the smart, keen, alert look, which cannot be attained with drooping ears. Points:—Head carried high, long, and not too broad; muzzle broad, strong, and blunt; eye small, with sharp expression; neck long and arched, free from dewlap; chest moderately broad; brisket deep; loin slightly arched; shoulders sloping; elbows well under; belly well drawn up; legs straight and muscular; second thighs long and strong; feet large, well-arched, and close; coat hard and dense; tail strong at root and ending fine, carried rather low. Colours, brindle, fawn, blue, black and white, and fawn and white.

Great Eastern, a paddle and screw iron merchant steamer, designed by T. K. Brunel and Scott Russell, and built at London in 1854-7. She was then by far the largest vessel in existence, being 679 ft. 6 in. long, and 82 ft. 8 in. broad, with a total tonnage of 18,915. Never a very successful speculation, she was useful, nevertheless, as a cable-laying ship (from 1865). In 1888 she was beached, and was eventually broken up.

Great Eastern Railway, Britain, represents an amalgamation in 1862 of almost all the railways of Essex, Suffolk, and Norfolk. The total mileage

is 1,206, the main lines running from London (Liverpool Street Station) to Norwich, Yarmouth, and Lowestoft, and to King's Lynn. It also owns about a dozen steamers working a continental service between Harwich and the Hook of Holland and Rotterdam. Paid-up capital, £54,206,707. The gross receipts for the year 1905 amounted to £5,885,641; the gross expenses, £3,632,614. The available balance enabled the directors to pay a dividend of 3½ per cent. upon the ordinary stock. The company employs electric traction upon some of its suburban lines, from which it draws a large revenue.

Greater Antilles. See WEST INDIES.

Great Falls, city, Montana, U.S.A., the co. seat of Cascade co., on the Missouri, 80 m. N.E. of Helena, in a rich mining region. The principal industry is copper and silver smelting. Pop. (1900) 14,930.

Great Fish Bay, 20 m. long, an inlet in the extreme S. of Portuguese West Africa.

Great Fish River. (1.) A turbid torrent (total length, 230 m.) of Cape Colony; rises in the Sneeuwbergen, and discharges into the Indian Ocean 15 m. N.E. of Port Alfred. (2.) Or BACK RIVER, British N. America; rises near Aylmer Lake, on N.E. of Great Slave Lake, and flows N.E. into the Arctic Ocean. Its length is about 500 m. In its estuary were discovered (1859) the final relics of Franklin's expedition.

Great Grimsby. See GRIMSBY.

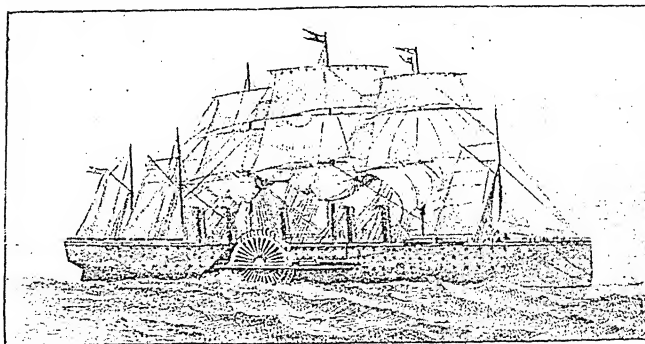
Greathead, JAMES HENRY (1844-96), British engineer, born at Grahamstown, Cape Colony; came to England in 1859, and

tube-railway now known as the City and South London, which was begun in 1886. Greathead took an important part in the construction of the Liverpool Overhead Electric Railway, and the Waterloo and City Railway in London.

Great India Peninsula Railway is the oldest in India. It was built in 1849, and has 2,683 miles open, the Indian Midland system having been amalgamated with it in 1900. The line (standard gauge) runs from Bombay to Kalyan, from whence it branches off in a north-easterly direction to Jabalpur, meeting the East Indian Railway; to Nagpur, meeting the Bengal-Nagpur Railway; and in a south-easterly direction to Raichur, where it meets the Madras Railway. The capital stock amounted to £20,000,000, bearing 5 per cent. interest, but is now represented by annuities and 3 per cent. Indian stock. In July 1900 the railway was purchased by the Indian government. The gross receipts for the year ending June 30, 1905, were £4,076,615, and the expenses £1,997,965.

Great Kanawha. See KANAWHA.

Great Lakes, THE, comprise the inland seas of Lakes Superior, Michigan, Huron, St. Clair, Erie, and Ontario, and are between British N. America and the United States. They are drained north-eastwards by the St. Lawrence R. to the Atlantic. Their area exceeds 90,000 sq. m. Their elevation varies from 600 ft. (Lake Superior) to 250 ft. (Lake Ontario). The fall from Lake Superior to Lake Erie is only some 30 ft., hence the great drop in the Niagara and St. Lawrence rivers. The moderating influence of this



The Great Eastern.

learned from P. W. Barlow the shield system of tunnelling, of which he made use in the construction of a subway below the Thames in 1869. Improved by him, the 'Greathead' shield was used in the tunnelling for the

volume of fresh water on the temperature of the surrounding country is so considerable that fruit culture has been largely developed along the shores of the lakes. More than one-half of the vessels registered in the United

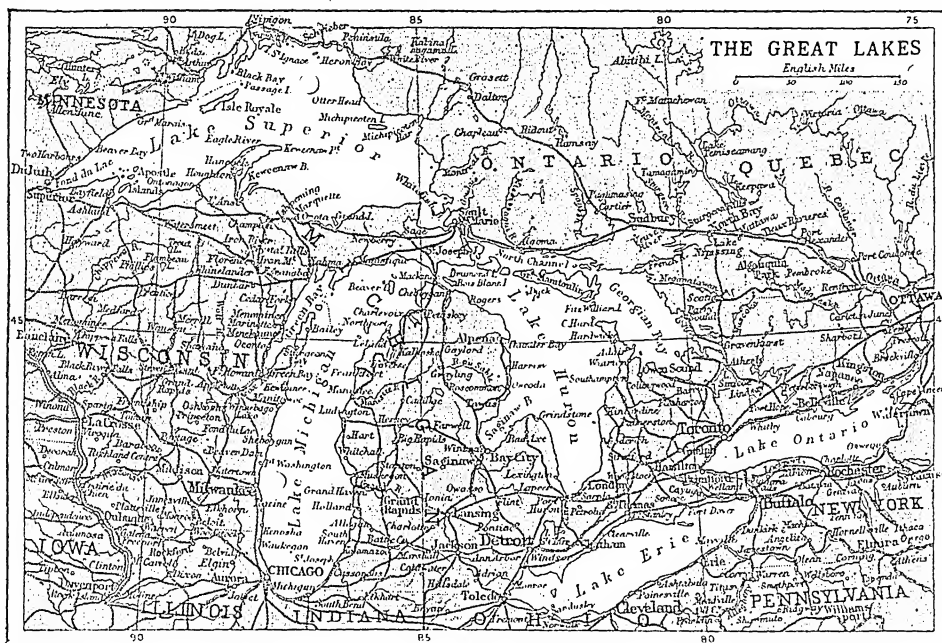
States are found on their waters. The principal lake ports are Duluth, Chicago, Milwaukee, Detroit, Cleveland, Buffalo, Hamilton, Toronto, and Kingston. A canal is in process of construction from Lake St. Clair to Lake Erie, which will greatly lessen the distance between the two lakes. The canal at St. Mary's Falls, through which considerably over 20,000,000 tons pass annually, has been excavated to the depth of 20 ft. The Welland Canal, between Lake Ontario and Lake Erie, allows vessels with a draught of 14 ft. to pass through. The lakes are frozen for four or five months in winter.

1905 the ordinary stock received a dividend of 33 per cent. The Great Northern Railway, with the North Eastern and North British companies, forms the East Coast route to Scotland.

Great Northern Railway of Ireland, incorporated in 1877, is an amalgamation of the Irish North-Western Railway, the Ulster Railway, the Northern of Ireland, and other smaller undertakings. The total mileage is 533, the main line being from Dublin to Belfast (112½ m.). Paid-up capital, £8,267,377; dividends at the rate of 6½ per cent. per annum have been paid for some years. The gross receipts for 1905

Greatrakes, VALENTINE (1629-83), 'the stoker,' was born in Co. Waterford, Ireland. After serving in the Cromwellian army in Ireland, he became a registrar and clerk of the peace for Co. Cork, of which offices he was deprived at the restoration. He then began to cure scrofula and other diseases by 'laying on of hands' in Ireland and England, and wrote a *Brief Account* of himself and his cures (1666).

Great Rift Valleys, a great depression extending from the Jordan and Dead Sea valleys of Palestine, through the Red Sea, thence across Abyssinia and French Somaliland to Lake Ru-



Great Marlow. See MARLOW.
Great Northern and City (tube line). See LONDON—Traffic.

Great Northern, Piccadilly, and Brompton (tube line). See LONDON—Traffic.

Great Northern Railway Company of England owes its origin to the amalgamation in 1846 of the London and York Railway and the Direct Northern Railway Companies. It has now a total mileage of 953, the main track extending from King's Cross, London, to a junction with the North-Eastern Railway at Shaftholme Junction, near Doncaster, via Peterborough and Newark. Paid-up capital, £53,631,640. Gross receipts for 1903, £5,872,017; gross expenditure, £3,776,036. For the year

amounted to £979,631, and the expenses to £533,100.

Great North of Scotland Railway was incorporated in 1846, and since then several lines have been absorbed into the system. The main line runs from Aberdeen to the Highland Railway at Elgin and at Boat of Garten, with branches to Ballater, Peterhead, Fraserburgh, Banff, etc.; total mileage, 336. The paid-up capital is £7,842,406. The receipts for year ending July 1905 were £494,953, and the working expenses £249,606, permitting a dividend of 3 per cent. on the preferred converted ordinary stock, and ½ per cent. on the deferred converted ordinary stock. Negotiations are now pending for the amalgamation of this company and the Highland Railway.

dolf. This Eritrean rift valley, after giving off a branch which proceeds w. and then s. (W. Rift Valley) through the Albert and Albert Edward Nyanzas to the southern extremity of Tanganyika, continues s. through Lake Barengo and Lake Manyara towards Nyasa. These rift valleys, formed by parallel fissures in the earth's crust, are narrow, elongated troughs, with (in Central Africa) precipitous walls rising from 4,000 to 5,000 ft. to the level of the intervening plateau.

Great Salt Lake, Utah, U.S.A., lies in the E. part of the Great Basin, near the foot of the Wasatch Mts. It is large but shallow, and its area changes greatly. Its water is highly charged with mineral salts, principally chloride of sodium; the human body

will not sink in it. The principal affluent is Jordan R., which drains Utah Lake on the S. Its area in 1900 was 2,280 sq. m. Garfield Beach, on the S. shore, is a bathing resort.

Great Seal. See SEAL.

Great Slave Lake, N.W. Territories, Canada, is about 300 m. long, with a breadth of 15 to 60 m.; area, 7,100 sq. m. Its shores are very irregular, the most important bays being McLeod Bay on the N., and Christie Bay on the S. From the W. side issues the Mackenzie R.

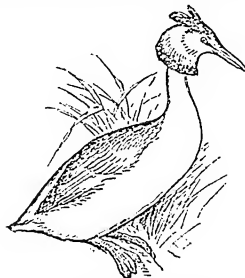
Great Slave River, N.W. Territories, Canada, issues from the W. of Lake Athabasca, and flows 300 m. N. into the Great Slave Lake. Except for the rapids near Fort Smith, it is navigable.

Great Smoky Mountains, a range of mountains forming the boundary line between N. Carolina and Tennessee, U.S.A.; a member of the Appalachian system. The loftiest summits are Clingman Dome (6,619 ft.), Mt. Guyot (6,635 ft.), and Mt. Leconte (6,612 ft.).

Great Southern and Western Railway of Ireland, originally established in 1844 to build a line from Dublin to Cashel, but subsequently diverted and extended to Cork, has the largest mileage (1,083) of any railway in Ireland. The paid-up capital amounts to £13,288,290. The average dividend is $3\frac{1}{2}$ per cent., though in 1905 it rose to $3\frac{3}{4}$ per cent. The gross receipts for the same year were £1,341,611, and the gross expenditure, £793,640.

Great Western Railway, Britain, established in 1835, is an amalgamation of over a hundred railways and canals in various south-western, midland, and Welsh counties, and owns a larger total mileage (2,755) than any other railway company in the United Kingdom. The main line runs from London to Penzance in the W., to Birkenhead in the N., and to New Milford and Fishguard in S. Wales. The paid-up capital amounts to £92,656,871; the dividend on ordinary stock for 1905 was $5\frac{1}{2}$ per cent. Gross earnings in 1905, £12,342,180; gross expenditure, £7,610,939. The company holds the record for the longest run without stoppage, the Plymouth express to and from Paddington covering the distance of 246 m. at an average speed of $55\frac{1}{2}$ m. per hour. The company converted their system from broad-gauge lines on May 21 and 22, 1892. The Great Western owns a fleet of 17 steamers, and opened (August 1906) a new route between England (Fishguard in Pembroke-shire) and Rosslare (in Wexford). The passage, the shortest between the two countries (55 m.), will be done in $2\frac{1}{2}$ hours.

Grebe, a name applied generally to the members of the cosmopolitan genus *Podiceps*, which are migratory aquatic birds, breeding near sluggish streams or stagnant water. There is no true tail, the wings are short, the toes broad and flattened, furnished with a lobate membrane and with flat claws. In Britain the commonest species is the little grebe, or dabchick; but the following are not uncommon: the crested grebe (*P. cristatus*), widely distributed in the Old World, but absent from the New; the red-necked grebe (*P. griseigena*), resident in the northern parts of Europe and Asia, except in the extreme north, where it is replaced by the Slavonian grebe (*P. auritus*).



Great Crested Grebe.

Grecian Architecture. See ARCHITECTURE.

Gredos, SIERRA DE. See GUADARRAMAS.

Greece, a kingdom of Europe, occupying the S. extremity of the Balkan Peninsula, together with the Ionian Is. on its W. coast, and the islands of the Ægean Archipelago E. as far as Seyros, Amorgos, and Anaphi. The total area in 1896 was 24,977 sq. m.: a reduction of 578 sq. m. has taken place since, through rectification of the N. frontier in 1897. Its mainland portion, bounded to the N. by the Turkish vilayets of Janina, Monastir, and Saloniki, is subdivided into three main regions—Northern Greece (Thessaly), ceded by Turkey in 1881, being separated from Central Greece by the Gulfs of Arta and Lamia, with an isthmus of about 70 m. across; and Central Greece, separated from the Morea (Peloponnesus) by the Gulfs of Lepanto and Ægina, with the Corinthian isthmus, only $3\frac{1}{2}$ m. wide. The physical configuration of Greece is determined by the Dinaric Alpine fold, which traverses the entire peninsula in a S.E. direction, and then, turning E. through Crete, forms the S. margin of the Ægean depression. Except in Upper Thessaly, no part of Greece is more than 40 m. from

the sea. It is this double character—alpine, yet submerged—which gives to Greece its peculiar geography. The Dinaric fold consists of several parallel ridges. The majority of these, where they enter the Greek peninsula, lie close together in its W. half, enclosing deep longitudinal valleys (Arachthus, Achelous) and mountain basins (Arta, Agrinion)—marshy, lacustrine, or gulfs, according to the level. Similar ridges, seaward, more deeply submerged, constitute the Ionian Is., from Corfu to Zanto. Along the E. coast a single similar ridge runs parallel and apart, S. from Olympus through Pelion and Eubœa to the island of Mykonos, enclosing a wider series of lacustrine plains (Thessaly) and landlocked gulfs (Volo and the Eubœan channels), and deeply gashed by the Peneios gorge (Tempe) and by the cross-trough of the Spercheus. Similar Dinaric structure recurs (1) in peninsular Attica and the western Cycladic chain as far as Siphnos, and coalesces with the Olympic ridge in the submerged Cycladic mountain knot; (2) in the Morea, where three main ridges enclose the basins of Tripolitza and Megalopolis, and the Laconian and Messenian gulfs, and sink seawards towards Crete in long promontories and a chain of islands (Cerigo). Frequent earthquakes, particularly on the S.W. coasts, suggest that dislocation still goes on; and numerous mineral veins, and a line of solfataras and volcanic vents, from Corinth, through Methana, Melos, and Thera, mark old or recent fractures.

The drainage system follows the mountain structure. The W. coast rivers, including Alpheus and Eurotas, all follow longitudinal valleys, or break through coast ranges by deep ravines; the Thessalian Peneios drains, fan-like, to one gorge (Tempe) through the coast range; the Spercheus delta rapidly blocks the Gulf of Lamia; the Copais trough drains artificially to the upper Eubœan channel, Asopus naturally to the lower; and the Attic streams converge on the Saronic gulf. The inland basin of Mantinea reinforces, underground, the streams of the Argive gulf, and N.W. Arcadia drains by cross-channels into the middle Alpheus.

Climate.—The prevalent winds are—(1) northerly, cold and dry, through spring and summer; (2) occasional violent counterblasts between S.E. and S.W.—the former dry, in spring and summer; the latter, in autumn, giving copious rain, and snow on the highlands. The high W. ridges precipitate most of the moisture

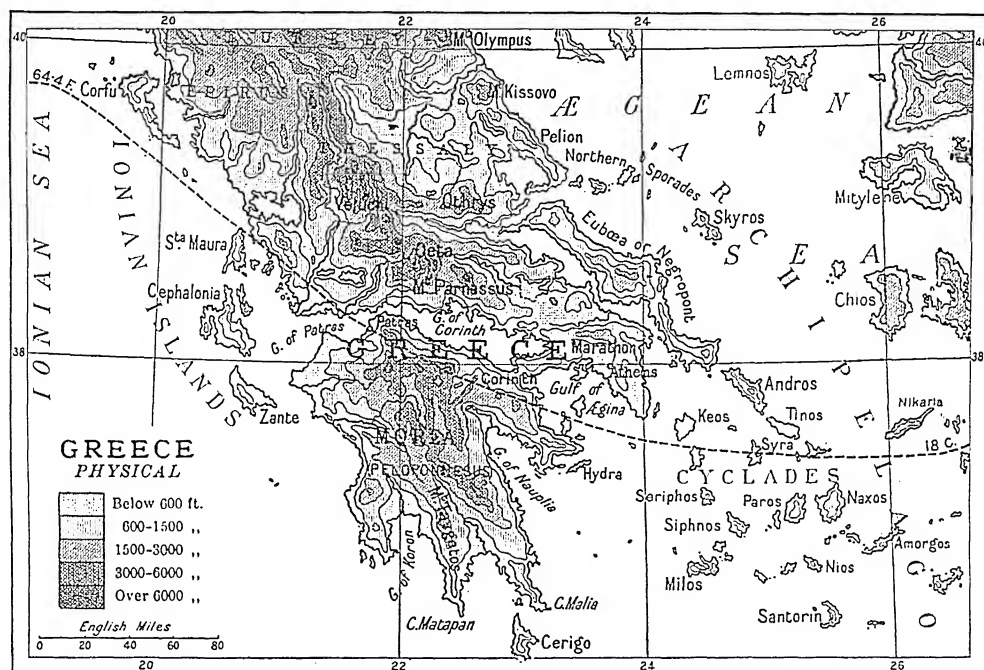
(for example, Corfu has twice the rainfall of Athens, and Thessaly is hotter and drier still), and also, anywhere above 4,000 ft., store up the winter snow. The general disappearance of the ancient forests, however, has deprived Greece both of rainfall and of reserves of soil; most heights are bare rock, and most streams dry by midsummer. The cool summer winds keep the climate healthy, and the mountains screen off the winter cold; but malaria infests all the marshland, and the clear air and sudden changes of temperature involve dangerous chills in winter and spring.

Flora.—Below 1,500 ft. evergreens prevail—cypress, myrtle, and olive, with oleander, iris,

riginal Mediterranean brunettes, purest in Crete and the remoter islands; (2) dark, sallow, brachycephalic Alpine highlanders, typically represented in Albania, but intrusive since Roman times over all the mainland of Greece, and over-sea as far as Andros; (3) scanty remains of those tall, fair, or ruddy north-ers whose successive invasions (Thracio-Phrygian, c. 1500 B.C.; Dorian, 1000 B.C.; Galatian, 275 B.C., etc.) mark the main turning-points of Aegean history. The invading Saracen (650-1000 A.D.) and Turk (1500-1800 A.D.) have hardly affected the ethnic type: it is Albanian blood which mainly differentiates modern from ancient Greek.

of the warm, well-watered lowlands permits of great variety of produce. Currants, oil, wine, and tobacco are staple products. Peasant ownership is the rule, but large estates predominate in Thessaly and in the reclaimed lands of the Copais lake area (1890).

Commerce.—The exports (1904) amounted to £3,653,000 (to United Kingdom, £1,328,234; the remainder chiefly to France, Hungary, and Turkey), principally currants (one-third total), figs and other fruit, oil, soap, wine and spirit, tobacco, hides, minerals, and sponges. The imports (1904) amounted to £5,510,000 (from United Kingdom, £1,251,642), mostly cotton goods and other manufactures,



anemone, gladiolus, and aromatic shrubs. Vine, fig, orange, and tobacco flourish, and (locally) cotton and date. Above 1,500 ft. comes a forest zone of oak and chestnut, wherever (as in the w.) the moisture suffices. From 3,500 to 5,500 ft. beech and pine supervene. Above 5,500 ft. begins a copious Alpine flora.

Population. 2,433,806 (1896), exclusive of Greeks resident abroad (4,000,000 in Turkey in Europe, 2,000,000 in Asia Minor, and 850,000 elsewhere). Cap. Athens; pop. (with its port, Piræus), 153,655 (1896), increasing rapidly. The population includes three main stocks, besides recent invaders—(1) abo-

Industry.—The principal industries are agricultural. Yet iron, manganese, zinc, and lead are mined at Laurion in Attica; magnesite and lignite in Euboea; emery in Naxos; manganese, baryta, sulphur, alum, and millstone in Melos; marble in Paros, Thessaly, Attica, the Cyclades; and gypsum in several places. In so mountainous a country cultivable land forms only 18 per cent. of the surface: vines cover 336,000 ac.; currants (average annual crop, 150,000 tons), 168,000 ac., mostly in the N.W. of the Morea; olives, 432,000 ac.; forest, 2,025,000 ac.; pasture (mainly sheep and goats), 5,000,000 ac. But the fertility

corn, timber, cattle and hides sugar, salt, fish, and coal.

Communications.—The principal railways (700 m.) connect (1) Athens S.E. with Laurion, W. with Corinth, Patras, and Pyrgos, S.W. with Tripolitza; (2) Volo with Larissa and Kalabaka. A line to connect Athens and Larissa is being constructed. Carriage roads are few and bad, diligence service rare and worse—almost all up-country travelling being on horses and mules. But the physical configuration permits easy access by sea to almost every important district; the coast trade is much facilitated by the completion (1893) of the Corinth Canal.

Administration.—Greece is a constitutional monarchy, established in 1830. The present king is George, second son of King Christian of Denmark (acc. 1863). The government is carried on by a ministry and a single chamber of 235 paid deputies, elected by manhood suffrage. The country was divided in 1899 into twenty-six nomarchies (provinces). The army is conscript. Two years have to be served in the active army, ten in the reserve, and eighteen in the National Guard reserve. The peace footing is 22,000 (1905); war footing, 82,000. The navy, partly conscript, consists of three small battleships and a number of old torpedo boats; but a new naval programme is now under consideration (September 1905).

Religion.—The large majority of the population (nearly two millions) are members of the national branch of the Orthodox Greek Church, which is in nominal subjection to the patriarch of Constantinople, but practically is administered by its synod and the metropolitan of Athens. But complete toleration exists. In Thessaly and the north-west there are 24,000 Moslems, and in the towns and ports some 15,000 Roman Catholics (mostly Italians and Maltese) and nearly 6,000 Jews.

Education.—Elementary education is free, and is compulsory from five to twelve. Technical and professional education is supplied by the university, the polytechnic, and the industrial academy (all in Athens), and by two schools of agriculture. The university has 54 professors and nearly 3,000 students (of whom about one-half read law).

Bibliography.—Neumann and Partsch's *Physikalische Geographie von Griechenland* (1885); Bursian's *Geographie von Griechenland* (1862-72); Philippson's *Der Peloponnes* (1892), *Thessalien und Epirus* (1897), *Inselwelt* (1901); Curtius's *Peloponnesos* (1851-2); Lolling's *Geographie und Geschichte des griechischen Altertums*, especially bibliography (1889); Bickford Smith's *Greece under King George* (1893); Rennell Rodd's *Customs and Lore of Modern Greece* (1892); Mahaffy's *Rambles and Studies in Greece* (3rd ed. 1887); Tozer's *Islands of the Aegean* (1890); J. T. Bent's *Cyclades* (1885).

HISTORY.—The people who called themselves Hellenes, and were known to the Romans as *Graeci*, probably entered the country from the north in successive bands. From the recent discoveries made at Troy, Mycenae, Tiryns, and elsewhere, it is quite clear that the Troad and the

eastern coast of Greece were once governed by powerful chiefs, who built palaces and citadels, traded with Egypt and Asia Minor, and got together stores of gold and valuables such as were unknown in Greece at a later time. And quite recently, at Cnossus in Crete, where tradition placed the home of Minos, a palace has been discovered with abundant remains of writing, of which there is no trace at Mycenae. Many reminiscences of this age of splendour are to be found in the *Iliad* and *Odyssey*, but these epics were not thrown into their present shape till long after the fall of Mycenae and Tiryns. The period of this Mycenaean civilization has been placed at 2000-1000 B.C. How it came to an end is unknown, but it is quite probable that this civilization fell before the attacks of ruder tribes from the north-west. In consequence of these migrations, colonies are said to have been founded by the expelled nations of the peninsula in Asia Minor, where they became grouped as Aeolian, Ionian, and Dorian. Owing to this expansion, the Phoenicians, who at one time certainly had many trading stations on the islands, and perhaps even on the peninsula of Greece, were driven out, and trade with the East languished.

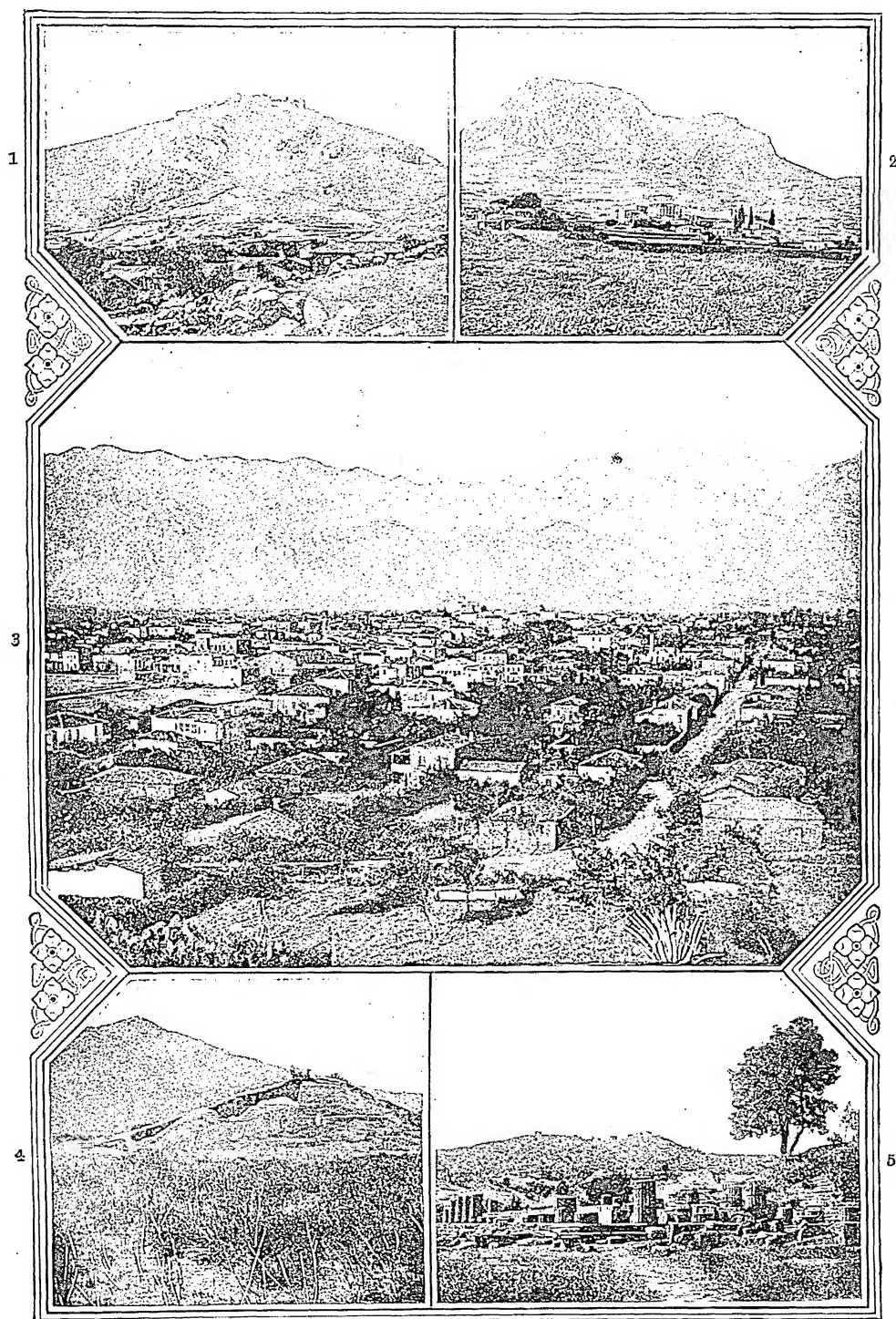
The period in which Greece was settling down after the migrations—i.e. the period from 1000 to 700 B.C.—is hardly known to us historically. In those dark ages the immigrants became grouped into cities—at any rate in the eastern part of the peninsula—under aristocratic governments, with a 'king' at the head. In some cases the communities were united in leagues, as in Arcadia and Boeotia; in others, one state conquered her neighbours, as Sparta conquered Laconia and Messenia; in the case of Athens, one city succeeded in making herself the centre of a whole territory. Cities sometimes joined in the common worship of a local deity, and formed an *amphictyony*; such existed at Onchestus in Boeotia; at Calauria, on the coast of Argolis; and, later, at Thermopylae and Delphi. Some of the oracular shrines to which the Greeks repaired to consult the deity became of national importance. The Olympic games also grew into a great national festival.

About the middle of the 8th century the monarchy, which had hitherto formed a part of the government of the cities, disappeared; only at Sparta was the office retained. About twenty years later began the period of colonization, which is so striking a feature in the history of Greece. A series of settlements carried Greeks to the shores of Chalci-

dice in Thrace; to those of the Propontis and the Euxine; to Italy and Sicily; and a new era of commerce was opened, extending all over the Mediterranean.

Of two cities only can any details be given—Athens and Sparta. Of these, Athens became the great democratic city, the home of free institutions and individual development. Sparta, which was far more representative of the Greek ideal, was severely 'regulated'; the citizen not only lived for the state, but was never free from state control. The constitution was traditionally carried back to Lycurgus. From the first this state was governed by two kings, and there were, of course, the 'elders' and the people. Lycurgus arranged the relations between these, and put an end to the prevailing misrule. The citizens of military age were arranged in *syssitia*, or 'messes,' of fifteen members each; every member had to provide, as his qualification of citizenship, a certain amount of food for the plot assigned to him or his forefathers by the state. From the age of seven the Spartan boy was brought up to an athletic military life. There was no aristocracy at Sparta; all lived a simple life in common, though differences of wealth were not unknown. In the 8th century, at the time of the first Messenian war (743-724 B.C.), new officers—the ephors—were created, who by degrees acquired an almost tyrannical power.

The impulse to colonization lasted on into the 7th century with increasing force. In the political life of the cities the qualification of birth was supplemented by, if not exchanged for, that of wealth; the magistrates were chosen for their riches rather than for their nobility. The people also began to make themselves a power. The settlers in the colonies were not all from one source; each band brought with it rules and customs which had to be harmonized with those of the rest. We now hear for the first time of written codes. Zaleucus and Charondas were instructed to draw up laws for their cities (in Italy and Sicily), and later on in the century (7th B.C.), in the time of Draco, the laws of Athens were published. Another effect of the ferment now going on in the Greek world was the appearance of the so-called 'tyrants'—men who raised themselves to a despotic position in the cities, and maintained their power by force. Such were the Orthagorids of Sicily, of whom Cleisthenes, the last and greatest, was on the throne at the end of the century; the Cypselids of Corinth, Cypselus and his son Periander (625-585); Theagenes of



Views in Greece.

1. Argos. 2. Corinth. 3. Sparta. 4. Marathon: the Mound. 5. Olympia: the Temple of Hera.

Megara, and others. In this century also, partly owing to more frequent contact with foreign nations, and partly to the habit of meeting at the public games (Olympia, Pythia, Nemea, Isthmia), which were greatly favoured by the tyrants, the Greeks became more conscious of a common nationality: one name, Panhellenes, and later Hellenes, came into use for the whole nation, though why this name was selected it is difficult to say. Owing to the impulse given to trade and maritime adventure, the Greeks now began to improve their ships, the Corinthians taking the lead; and a new system of weights and measures (the Æginetan), perhaps even the beginning of a coinage, was introduced by Pheidon of Argos, who for a time raised his city to something of her old pre-eminence. The century was remembered for two great wars which occurred in it: (1) the war between Chalcis and Eretria, both in Eubœa—a war in which most of the leading Greek states took part on one side or the other; and (2) the second Messenian war (645-628 B.C.), in which Sparta finally reduced Messenia to subjection.

Of Athens we hear little. Toward the end of the century Cylon attempted to make himself tyrant of the city, but without success, and his party were suppressed (640 B.C.) with a sacrilegious rigour which left a curse on the Alcmaeonidae, the perpetrators of the crime. After Cylon's attempt, Draco was commissioned to write out the laws of the city, and so far as homicide went, his ordinances remained in force for later Athens. The constitution of the city was at this time severely oligarchic. The council of the Areopagus had supreme authority over everything—electing the nine archons, the chief executive officers, and receiving them into the council at the end of their year of office. The oligarchs employed the poorer citizens to cultivate the land on a *métayer* system. If the cultivator was unable to pay his part of the produce, he could be sold with his wife and children into slavery. Soon after the beginning of the 6th century the situation at Athens became critical. The nobles were divided into factions, chiefly in regard to the guilt of the Cylonian massacre; the commons were being sold into slavery. A contest was also raging with Megara for the possession of Salamis. The city was beginning to despair of success, when Solon urged them in an elegiac poem to renew the struggle, and Megara was defeated. In another poem Solon spoke out plainly on the state of Athens. He thus became the fore-

most man in the city, and in 594 B.C. was chosen archon and 'reconciler' of the state. He began with a strong measure, the *Seisachtheia*, or shaking off of burdens, by which all debts on the security of land and person were entirely cancelled; and for the future it was forbidden to lend money on the security of the person. Solon also reorganized the political constitution of Athens. While permitting the Areopagus to remain, as guardian of the laws and as moral censor, he placed beside it a council of four hundred members, chosen equally from the four tribes of the citizens, which prepared subjects for discussion in the assembly (of all the citizens over twenty years of age). The citizens were divided into four classes, according to their wealth, and on his place in this classification depended a citizen's eligibility to office. All the people had the right of attending the assembly, and of choosing the magistrates. They could also demand an account from them at the end of their year of office. They decided in the assembly on questions of war, peace, etc. A popular law court was also formed of citizens over thirty, to whom any citizen could appeal from the sentence of a magistrate; and every Athenian had the power of lodging a complaint on behalf of any citizen whom he saw oppressed or injured. This constitution was the first step to democracy at Athens. But Solon's political arrangements did not last long. Shortly after 600 B.C. we find Attica divided between the parties of 'the plain,' 'the shore,' and 'the mountain'—i.e. between the nobles, the merchants, and the hill folk of the north. At the head of the last was Pisistratus, a man of noble birth, who, with the help of his democratic following, made himself tyrant of Athens (560 B.C.). For the next fifty years, with some interruptions, Athens was governed by tyrants, first under Pisistratus, who died in 527 B.C., then under his son Hippias. At length the Alcmaeonidae engaged the Delphic oracle to persuade the Spartans to assist them in driving out the tyrant. The Spartan king, Cleomenes, invaded Attica in 510. Hippias was compelled to come to terms, and left Athens for Sigeum in the Troad. Cleomenes supported the oligarchs, who were led by Isagoras. But Cleisthenes, the head of the Alcmaeonidae, was not inclined to see others enjoying the fruit of his efforts. He gathered the people round him, and was laying the foundations of a great political reform, when his progress was arrested by Cleomenes, who appeared at Athens, demanding

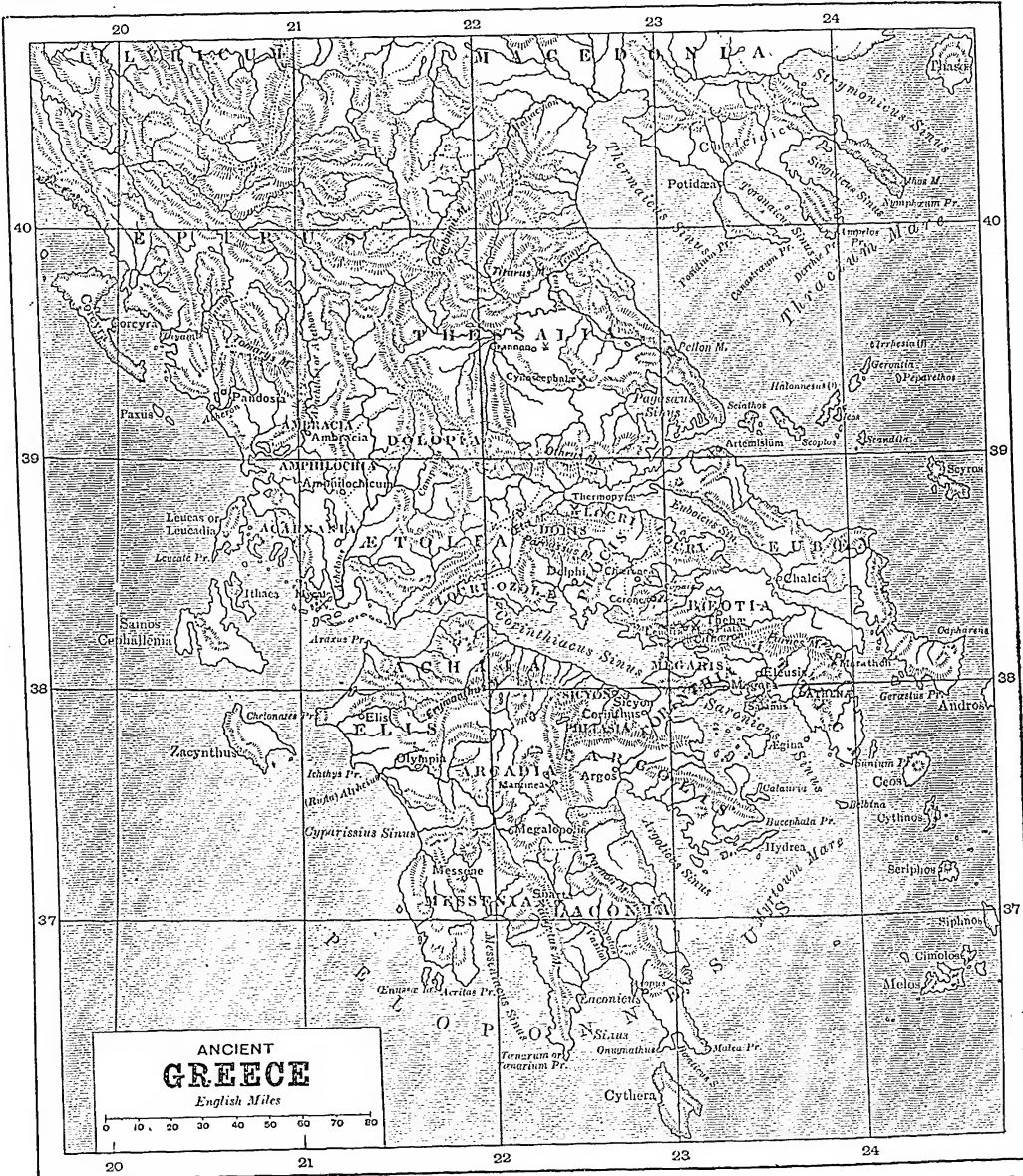
his expulsion as one of the 'accursed.' Cleisthenes left Athens, and Isagoras became archon in 508. But he was besieged with Cleomenes in the Acropolis, and after two days compelled to capitulate. A second effort to restore Isagoras with the forces of Sparta was wrecked by the quarrel of the two kings, Cleomenes and Demaratus. Cleisthenes returned and carried out his reforms. The structure of the constitution was changed. The political unit was now the *demos*, or township. Each of these had a governor, or *demarch*, and a council, at which the *demesmen* met. The *demes* were arranged in ten tribes, in such a manner that the *demes* of the same tribe were not contiguous. In these new tribes were included many inhabitants who had not hitherto counted as citizens, because they had not belonged to any of the ancient families. They were now collected into religious associations, and in their case this tie took the place of the tie of blood. From each of the ten tribes fifty members were annually chosen to form a council of five hundred, which took the place of the Solonian council of four hundred. The powers of the Areopagus were not altered by Cleisthenes. In order to prevent the recurrence of a tyranny, the decree of ostracism was invented, by which any citizen whose power seemed to threaten the peace of the city could be sent into banishment for ten years without loss of civic rights. Towards the middle of the century the long struggle with Megara for the possession of Salamis was decided in favour of the Athenians, who occupied the island with 'settlers' (*kleruchs*). Sigeum, on the other hand, which Periander of Corinth had assigned to Athens, was again lost to the Mytileneans; but the loss was compensated by the establishment of Miltiades in the Chersonesus. After the expulsion of the tyrants, Athens was not only threatened with invasion from Sparta, but was attacked by Boeotia and Eubœa. She defeated both, and sent four thousand of her citizens to occupy the best land in Eubœa. Against Ægina, which came to the help of Boeotia, she was less successful. The feud, which was of old standing, continued for years.

Sparta became a centre to which the cities which had suffered from the oppression of tyrants looked for help, and in the course of the century the Peloponnesian confederacy was formed, with Sparta at the head. She was now recognized as the leading state in Greece. Chilon, who was ephor in 556, was always held in honour as one of the foremost of Spartan

statesmen. Towards the close of the century there seems to have been a serious quarrel between King Cleomones and the ephors, who by this time had acquired almost supreme power, and interfered in the domestic life of the

sive power of the oligarchs, and raising their cities to a height of power which, in many of them, was never surpassed. Everywhere they favoured the people. They established popular festivals, such as the Dionysiac at Athens, and

was, of course, another side to the picture. Many of them used their power for the worst purposes, and trampled on all law in the gratification of sensuality and greed. The period of their rule was regarded as an enslavement



royal families. The result was disastrous both to the state and to the king. A distinctive feature of this period is the disappearance of the tyrants. But the tyrants did a great work in Greek political history, breaking the exclu-

encouraged the national festivals, of which, indeed, they seem to have been, in some cases, the founders. With a true instinct for the genius of their nation, they fostered the development of art, plastic and poetic. There

of the city, and the tyrannicide was held in honour as one who had liberated his fellow-citizens and avenged their wrongs.

The 5th century in the history of Greece comprises three great events—the Persian war, the rise

of the Athenian empire, and the Peloponnesian war. Athens now became beyond question the foremost state in Greece, but her rise to power created bitter jealousies. Greece, which seemed to be united in opposition to an invader, became sharply divided—Dorian against Ionian, the Peloponnesus against Athens, and democracy against oligarchy. Quite at the beginning of the century the Ionians in Asia revolted from the 'great king' (i.e. of Persia), and Athens, as an Ionian city, was drawn into the conflict. When the revolt had been suppressed, a Persian army and fleet were dispatched under the command of Mardonius, which penetrated as far as Mount Athos. Here the fleet was wrecked in a storm, while the land force was severely defeated by the natives of Thrace. Two years later (490 B.C.) Darius equipped another force, which was sent straight across the Aegean, in the best season of the year, to Eretria in Euboea and to Marathon in Attica, whither they were guided by Hippias, the exiled tyrant of Athens. The Athenians, supported by the Plataeans only, engaged with the Persian army, and were successful, driving the enemy to their ships with great slaughter. A second attempt to punish the Athenians and subjugate Greece ended, like the first, in failure (490).

In the spring of 480, Xerxes, the son of Darius, appeared at the Hellespont, with an army and fleet larger than had ever been seen before. The Greeks meanwhile were in the greatest alarm. A number of states, including Thessaly and the adjacent tribes, Locris, and Boeotia (except Plataea and Thespie) gave tokens of submission to Xerxes. Even Delphi wavered, and when the oracle was consulted by the Athenians, the response was far from encouraging. The Athenians determined on resistance. Troops were sent under the command of Leonidas, the Spartan king, to Thermopylae, and ships to Artemisium (north end of Euboea). Here, about August 480, battles were fought on land and sea. On land the Persians were unable to force a way through the pass, till, owing to the treachery of Ephialtes, they got behind the Greeks, who were surrounded and cut down. At sea the Persian fleet suffered severely from a storm which overtook it on the rock-bound coast of Thessaly. The remaining ships were defeated by the Greeks, and another squadron perished in the attempt to sail round Euboea. The commander of the Athenians was Themistocles, and to his stratagems it was due that the

decisive battle took place in the narrow waters of the bay of Salamis. The Persians were severely defeated, and Xerxes, who had entered Attica and occupied Athens, determined to retreat, leaving Mardonius behind to renew the invasion in the following spring. Mardonius retired to Thessaly for the winter. In the spring of 479 he again marched south, and, after devastating Attica and Athens more completely than before, retired upon Thebes. The Greeks followed him, and the battle of Plataea was fought, in which Mardonius was defeated and slain. In the same summer the united Greek fleet, under the command of Leotychides the Spartan king, sailed across the Aegean to Samos, and defeated the Persian fleet on the opposite promontory of Mycale. Thus by land and sea the Persian power was overthrown. In the year of the battle of Salamis (480), Gelo, the tyrant of Syracuse, defeated the Phoenicians at Himera in Sicily, and rolled back the tide of 'barbarian' invasion in the west, as it had been rolled back in the east.

The Athenians now received into alliance the Ionians and islanders, with whom they sailed to the Hellespont to begin the siege of Sestos. Next year (478) the Spartans sent out Pausanias, who had commanded their army at Plataea, to take charge of the fleet. He got possession of Byzantium, but, seduced by the display and luxury of the Persians, forgot his allegiance to Greece. The allies (Ionians and others) called upon the Athenian commanders to take the lead. Upon this the Peloponnesians withdrew, and the conduct of affairs at sea was left in the hands of Athens. The Delian League was now founded (477 B.C.) by Athens and the allies. The cities who joined were required to furnish ships or 'tribute' towards the formation and maintenance of a common fleet. The league continued for about twenty years, when Athens began to assert her power. Cities which attempted to break away from the league were compelled to remain in it, and by 440 B.C. only three cities—Samos, Chios, and Lesbos—remained free and independent members as at the first. The league was now the Athenian empire. In 440 Samos endeavoured to break away from the control of Athens, but after a long siege she was reduced; and no further attempt was made till the revolt of Mytilene in 428.

At the time of the last Persian invasion (480) the government of Athens passed mainly into the hands of the Areopagus; but the democratic spirit which had been growing in the city since the time of Cleisthenes, and which

had received a great stimulus from the successes of 490 and 480, found expression in Themistocles and Ephialtes. Themistocles, who in spite of his great services both at Salamis and in the next year when he succeeded in getting the walls of Athens rebuilt and the Piræus fortified, was disliked by the noble families, was got rid of, first by ostracism (471 B.C.) and afterwards by condemnation for 'Medism,' which compelled him to secure the protection of the Persian king (464 B.C.). Ephialtes, a few years later, attacked the Areopagus, and greatly curtailed its power, but in a short time he perished (457 B.C.) by the hands of an assassin. His place as a leader of the democracy was taken by Pericles, the son of Xanthippus and Agariste, of the family of the Alcmæonidae. The aristocratic party were led by Cimon, the son of Miltiades, the hero of Marathon; but he fell under the displeasure of the people, and was ostracized for persuading them to send help to Sparta at the time of the Messenian revolt (see below)—help which was rudely dismissed. Pericles, now without a rival, took from the Areopagus what little remains of authority Ephialtes had left it, and greatly increased the power of the law courts. A great expedition was sent to Egypt during Cimon's absence, to aid Inaros in his revolt against Persia, but after six years of warfare it perished miserably (455 B.C.). The conduct of Sparta towards the troops sent to her aid was deeply resented by Athens, who renounced her alliance with the city and entered into relations with Argos and Thessaly, while her fleet attacked Egina. She also received Megara under her protection. Defeated by the combined Spartans and Boeotians at Tanagra (457 B.C.), she returned to the attack four months later, and the victory at Enophryta made her mistress of Boeotia and the countries beyond as far as Thermopylae. Cimon was now allowed to return (454 B.C.). By his mediation a peace was arranged (451) for five years with Sparta, and Athens was thus free to attack Persia again. But the tide now turned against Athens. The Boeotians rose, and defeated her so decisively at Coronea (447) that she was compelled to withdraw from the country. Euboea then revolted, and Megara threw off her allegiance. Argos had already abandoned Athens, and entered into alliance with Sparta. The five years' truce was also at an end. Pericles succeeded in reducing Euboea, and in buying off an invasion of Attica by Pleistoanax,

the Spartan king; but he found himself compelled to enter into a new peace with Sparta, the 'thirty years' peace' (446-445). Under the rule of Pericles Athens became the most beautiful city in the world. Pericles was fortunate in having the assistance of the greatest architects and sculptors of his time, among whom Phidias held the leading place; and Athens was now the home of the great dramatic poets, Æschylus, Sophocles, Euripides, Cratinus, and Aristophanes. Thither, too, were attracted philosophers and teachers from all quarters, among them Anaxagoras of Clazomenæ, who exercised a great influence on Pericles. Meanwhile difficulties arose with the Corinthians about Coreyra and Potidæa. The Megarians also complained loudly of a decree which Pericles had passed, excluding them from the ports in the Athenian empire. Sparta, as head of the Peloponnesian confederacy, declared that the peace of 446-445 had been broken; and Thebes, her ally, seized the opportunity to make an unexpected attack on Platæa (April 431). Thus began the Peloponnesian war, which brought all Greece into conflict, and lasted till near the end of the century, with the result that the empire of Athens was destroyed, and Sparta once more became the leading state of Greece. This result was mainly due to the incapacity or rivalry of the popular leaders at Athens, after the death of Pericles (429); the waste of resources on the expedition to Sicily (415-413), which ended in the utter destruction of the forces sent out; the party quarrels which led to the revolution of the Four Hundred (411); and the close connection formed between Persia and Sparta, especially between Cyrus and Ly-sander (405).

In the earlier part of the 5th century Sparta suffered much from the misconduct of her kings. Cleomenes deposed his fellow-king, Demaratus, by falsely impugning the legitimacy of his birth. Leotychides, who profited by this fraud, was detected receiving bribes when in command in Thessaly. Sparta's withdrawal from the leadership of the fleet also lowered her in the eyes of the Greek world, and even her allies—especially the Arcadians—became hostile to her. In 464 a terrible earthquake occurred, which all but laid the city in ruins. The helots seized the opportunity to revolt, and the city was brought to the brink of ruin. She was saved by the energy of King Archidamus; but the rebels long maintained themselves on Mount Ithome, and it

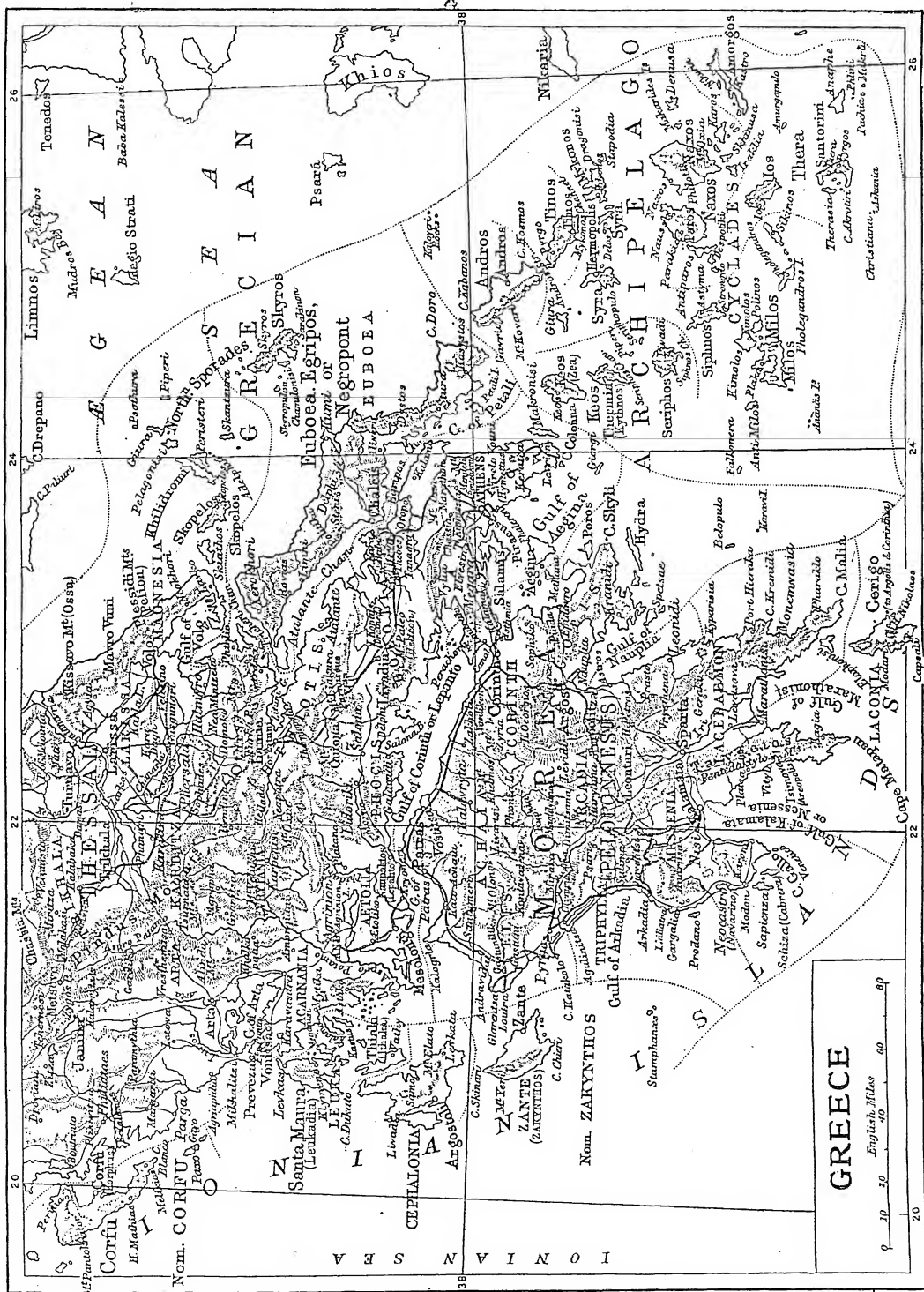
was during the siege of this place that the Athenians sent the help which was so rudely dismissed.

The attempt of Sparta, after her conquest of Athens in 404 B.C., to administer her empire by a series of oligarchies established in the cities created the greatest dissatisfaction, and it was in vain that she endeavoured to fortify her position by declaring war on Persia. In 394 B.C., Athens, with Thebes and Corinth—cities which ten years before had been most hostile to Athens—declared war on her (the Corinthian war). But though the allies were defeated at Nemea and Coronea, the war lingered on for years. Meanwhile the Peloponnesian fleet was severely defeated (394) by the Persians under Conon, an Athenian, and Pharnabazus at Cnidus, and ceased to be a power in the Ægean. Soon afterwards the fortifications of the Piræus and the 'long walls' of Athens, which had been destroyed at the time of the fall of the city, were rebuilt with the help of money supplied by Conon and Persia. Athens was once more an impregnable maritime city. The war, both in Greece and in Persia, lingered on till 387, when the peace of Antalcidas was concluded. The cities on the Asiatic coast were given up to Persia; the cities in Greece, whether small or great, were to be independent. The carrying out of the terms was left to Sparta, who thus continued to be the leading state. She abused her authority, not only by breaking up Mantinea into villages and destroying the Olynthian League, but by seizing the citadel of Thebes (382), which was not recovered till 379. Her conduct led to the formation of the second Delian League, for protection against her. It was chiefly the work of Timotheus, the son of Conon, and of Callistratus. At this time Thebes was gaining power. Led by Epaminondas and Pelopidas, she attempted to accomplish the centralization of Bœotia. To this Sparta was violently opposed, and her opposition led in 371 to the battle of Leuctra, in which the Spartans suffered the severest defeat they had ever known. The result was a complete revolution in the Peloponnesus. Megalopolis was founded in Arcadia; the Messenians were recalled from exile, and gathered together in the city of Messene, on Mount Ithome. Sparta's power was broken—a great calamity, in some ways, for Greece; and Thebes was regarded with hatred even by her old friends. The greatest confusion prevailed. At the battle of Mantinea (362), when Spartans and Thebans were again pitted together, Epaminon-

das was slain, and Thebes was thenceforth unable to maintain her position.

Within a few years important changes took place. In 359 Philip II. ascended the throne of Macedonia. War was declared on him by Athens in 357, and continued till 346, when it was brought to an end by the peace of Philocrates. In this interval two other wars occurred, both disastrous to the fortunes of Greece. The leading cities in the new confederacy revolted from Athens, and maintained their independence (Social war, 357-355); and central Greece was devastated by the so-called Sacred war between the Phocians, who used the treasures of Delphi to pay mercenary soldiers, and Thebes. In 348 Philip captured Olynthus, and subsequently he defeated the Phocians, who were abandoned to him at the peace. In 340 war was again declared upon Philip by Athens. Demosthenes did his utmost to combine Greece against him, and with some success: the Athenians and Thebans drew together, and an alliance was formed with Byzantium, which was saved from Philip. The final conflict came in 338 at Chæronea. The Greeks were defeated, and Greece passed under the control of Macedon. Sparta remained sullenly aloof, though the liberties of Greece were at stake.

In the autumn of 338 Philip reorganized the Greek world, Sparta excepted, under his supremacy. A congress was summoned at Corinth, at which he was recognized as the head of Greece, and preparations were made for invading Persia. But in the summer of 336 Philip was struck down by an assassin. The Greeks at once conceived hopes of regaining their freedom, for Alexander, the son of Philip, was quite young and unknown. They were, however, quickly undeceived. In the autumn of the same year Alexander appeared with an army in Greece, and a second congress was summoned at Corinth, at which his supremacy was recognized. Alexander now turned his attention to the wild tribes north of Macedon, and the news was brought to Greece that he had fallen in battle against the Illyrians. Thebes at once rose, and besieged the Macedonian garrison in the citadel, calling on Athens and the Peloponnesus for help. But Alexander appeared in Greece in an incredibly short time; Thebes was taken and utterly destroyed—a lesson which was not lost on the patriotic party. Alexander was now able to carry out his great object, the invasion of Persia, for which see ALEXANDER THE GREAT. His conquests



made it possible for Greek civilization to penetrate the East as it had never done before. Greek colonies were founded even as far as the Jaxartes, and Greek cities grew up in Western Asia, from which the language, habits, and religious rites of the Greeks spread in every direction.

When the news of Alexander's death arrived in Greece, another blow was struck for freedom (Lamian war, 323-322). The rising, after attaining some success, was crushed at Crannon by Antipater, the Macedonian general. He demanded from Athens the surrender of Demosthenes, who to escape took poison (at Calauria, 322 B.C.).

The throne of Macedon was occupied by Antigonus Gonatas (283-239) and his descendants. In 280 B.C. Greece was terrified by an invasion of Celts, who advanced as far as Thermopylae and Delphi; but they were repulsed with great slaughter. By 269 B.C. Antigonus was master of Greece, with the exception of Sparta. He established his power by placing tyrants in the various cities—a step which, of course, excited violent opposition. With the help of Aratus of Sicyon, the Achaean cities in the north of Peloponnesus consolidated and enlarged their ancient league; and as the centre of free Greece it was joined by numerous cities—Sicyon, Corinth, Megalopolis, and finally Argos. Between Sparta and the league relations became unfriendly. Sparta was at this time in a state of revolution. Agis IV., and subsequently Cleomenes III., endeavoured to equalize property and restore the older and simpler habits of the city; for two-fifths of the land was now owned by women, and, owing to the concentration of property in a few hands, only seven hundred fully qualified citizens remained. Agis was put to death. But the decline of Sparta was not to be arrested. Cleomenes got rid of the ephors, who were the great opponents of reform, and finally, to gain a stronger position, declared war on the Achaean League. Aratus called in the aid of Antigonus Doson of Macedon (229-220), with the result that Cleomenes was defeated at Sellasia, and fled to Egypt (221). The Aetolian League, which now became of importance in Greece, had no political aims like the Achaean, but made war merely with a view to its own interests, for the sake of conquest and sport. At one time it gained a number of cities in central Greece, and made war on Macedon; at another in Peloponnesus, and joined the Achaeans against Sparta; at another it was hos-

tile to the Achaeans, and defeated them.

In 220 Philip III. succeeded Antigonus as king of Macedon. Three years later he was aiding the Achaeans against the Aetolians when he received the news of Hannibal's victory at Lake Trasimene (217). He at once put an end to the war with the Aetolians, and prepared to support Hannibal. The Romans retaliated by inciting the Aetolians against him (211-207). After an interval of peace Rome and Philip were again at war, and the Achaean League joined Rome. The decisive battle was fought at Cynoscephalae in Thessaly (197), and at the Isthmian games of 196 B.C. it was proclaimed that 'the Roman Senate and Titus Quinctius (Flamininus), having overcome King Philip and the Macedonians, gave liberty to the Corinthians, Phocians, Locrians, Euboeans, Achaeans of Phthia, Magnesians, Thessalians, and Perrhaebians, with exemption from garrisons and tribute, and permission to govern themselves by their hereditary laws.' In 189 B.C. the Aetolians were finally crushed by the Romans as a punishment for the part which they had taken in aiding Antiochus, king of Syria. Ten years later Philip was succeeded by Perseus, who became involved in war with the Romans in 172, and was finally defeated at Pydna by Aemilius Paullus in 168. This was the end of the Macedonian monarchy.

The Achaean League, whose military system had been reformed by Philopoemen after the death of Aratus, continued to carry on hostilities with Sparta, in the hope of forcing the city to join them. Sparta appealed to Rome, who was thus brought upon the scene in southern Greece. War was declared on the Achaeans, and Mummius was sent with an army to bring the confusion to an end. He took and destroyed Corinth, and the Achaean League was reduced to its original form (146 B.C.). Greece, the northern part as Macedonia, the southern as Achaia, passed into the control of Rome, Achaia being governed by the praetor of Macedonia, which was now constituted a Roman province. The cities were allowed to retain their institutions and laws, but ceased to have any political existence.

A period of just and wise administration under the Roman rule ensured prosperity to the country, unbroken until the outbreak of the Mithridatic wars in B.C. 88; but this national revolt against the republic was of little avail, and the hand of Rome fell heavily on the Greek cities. Un-

der the emperors Greece again became prosperous; its supremacy in thought and letters was acknowledged, and much was done to restore its ancient splendour. During the 3rd century A.D. the long-continued tranquillity of the country was broken by the invasion of the Goths, who overran the peninsula and captured Athens, Corinth, Sparta, and other towns. Towards the end of the 3rd century Christianity began to spread, although it had to contend with strong opposition from the learned of Athens, which city to the last remained the centre of pagan culture. After the fall of Rome, Greece formed part of the Eastern or Byzantine empire. Byzantine rule practically ceased with the founding of the Latin empire of the East in 1204; but this was short-lived, and came to an end in 1261. The peninsula was then divided into a number of feudal fiefs, of which the duchy of Athens existed longest—for a hundred years under the Frankish house of De la Roche, then as a dependency (1311-85) of the kingdom of Aragon, and lastly as a fief of the Florentine house of Acciajuoli—until Greece was subjugated by the Turks in 1460, although many of the islands remained in Venetian hands till 1718. This conquest did not take place, however, without many serious attempts being made to regain possession of the country. The great victory of Lepanto (1571) produced little permanent effect; but the Venetian campaign of 1684-7 (during which the Parthenon was ruined by the bombardment of Athens) resulted in the conquest of the Morea and Attica. The Venetians, however, were again ousted in 1715 by the Turks, and by the peace of Passarowitz (1718) the whole country fell to the Ottoman empire.

Early in the 19th century the spirit of national independence awakened in Greece, and in March 1821 the standard of revolt was raised at Jassy, Moldavia. The Turks characteristically attempted to crush the revolt by wholesale massacres and executions, but without success, and in January 1822 the first National Assembly drew up a constitution at Epidaurus. Heroic deeds on the part of the Greeks and continued massacres by the Turks evoked in Europe an intense sympathy with the Hellenic nation, largely influenced by the passionate poetry of Byron. A last desperate effort was made by the Turkish government to overcome the Greeks, and an Egyptian army of some 20,000 men, under the ill-famed Ibrahim Pasha, was landed in the Morea in February 1825.

Within six months the Turks had entire possession, and the Greek cause seemed doomed. But Britain, France, and Russia, in the London protocol of July 6, 1827, called for an armistice, and the defiant attitude of Ibrahim Pasha resulted in the decisive battle of Navarino, October 20, in which the combined Turkish and Egyptian fleet was annihilated by that of the allies. The success in 1828-9 of the Russian attack by land on Turkey finally forced the Porte to yield, and by the London protocol of February 1830 Greece was declared an independent kingdom.

After an unsuccessful attempt to rule by National Assembly, the powers again stepped in: a monarchy was established, and Otho, second son of Louis I. of Bavaria, was placed on the throne. The reorganization of the country was taken in hand, and a loan of nearly 2½ million pounds was guaranteed by the powers, and in 1835 the seat of government was transferred from Nauplia to Athens. King Otho, however, failed to come into touch with his subjects, and the refusal of a constitution provoked a bloodless revolution (1843) which compelled the king to yield. Yet the national discontent increased—largely through the intervention and occupation of the country by French and British forces (1854) to prevent Greece assisting Russia in the war against Turkey. A revolt again took place in 1862, when Otho was deposed and compelled to leave the country. The new king was George, second son of the king of Denmark, who began to reign as George I. The Ionian Is., which since 1815 had been under British protection, were transferred to Greece.

The Berlin Congress (1878) proposed a readjustment of the Greco-Turkish boundary, but not till 1881 was the compromise offered by the Porte accepted. By the readjustment Greece received all Thessaly south of the northern watershed of the Salambria, and the country to the boundary of the Arta river. But Greece claimed Crete as well, regarding that island as a natural Hellenic possession. Dissatisfaction, fanned by an energetic war party, became rampant, and the national passion broke out into a war with Turkey in April 1897. The Greek army was wholly unprepared, badly officered, and utterly inefficient; while that of Turkey was comparatively well organized, as the short campaign of one month proved. The Greeks made no determined stand, and after a series of disastrous routs the country was at the mercy of the Turks, and their advance was

stopped only by the peremptory demand made by Russia on Turkey for an armistice. This was concluded on May 18, and on December 4 a treaty was signed at Constantinople whereby Greece was compelled to pay an indemnity of £3,600,000, to submit to a rectification of the frontier, and to accept international control in financial matters. Through the intervention of the powers, however, she suffered little loss of territory. In 1898 Prince George of Greece was appointed by the powers high commissioner of Crete, a position he resigned in 1906. The most noteworthy events in recent years have been the granting of a monopoly in the currant crop to British buyers; a rupture of diplomatic relations with Roumania, arising out of the Sultan's official recognition of the Roumanian or Kutzio-Vlach race in Macedonia; and the signing of a most-favoured commercial treaty with Great Britain—all in 1905.

Bibliography.—Thirlwall's and Grote's are among the best histories of Greece; that of E. Curtius (Eng. trans. 1867-73) is bright and interesting, but better for art and literature than for politics. Later works are those by A. Holm (4 vols.; Eng. trans. 1894), E. Abbott (3 vols. 1888), Oman (7th ed. 1901), and Bury (1900). Most important for the early history are the works of Schliemann and Tsountas, and the papers on Crete by Mr. Evans in the *Journal of Hellenic Studies*. Ridgeway's *Early Age of Greece* (1901), and H. R. Hall's *The Oldest Civilization of Greece* (1901). Excellent histories in German are those by Busolt (1885, etc.) and Beloch (2 vols. 1893). See also Finlay's *Greece* (new ed. 1877); Tennent's *Modern Greece* B.C. 146 to A.D. 1820 (1830); Jebb's *Modern Greece* (1880); Phillip's *The Greek War of Independence 1821-33* (1897); Rickford-Smith's *Greece under King George* (1893), the works of Professor Mahaffy, *Social Life in Greece* (3rd ed. 1877), *Greek Life and Thought from the Age of Alexander to the Roman Conquest* (2nd ed. 1896), *Problems in Greek History* (1892); and *A Companion to Greek Studies*, ed. by Leonard Whibley (1905).

LANGUAGE AND LITERATURE.

1. *Language.*—The Greek language belongs to the Indo-European family of tongues, its closest relations being with the Indian members of the family on the one side and the Italic on the other. Like the other Indo-European languages, Greek is synthetic and inflectional. It is one of the characteristics of Greek that it has preserved its inflections with great distinctness, largely owing to the fact that it did not possess a strong stress-

accent. Among the inflections possessed by Greek may be mentioned reduplication—i.e. the repetition before the word stem of its initial consonant followed by a vowel (usually *e* or *i*) to denote persistence of action, especially in verbs, and to form the perfect tense in Greek verbs. In the inflection of nouns, Greek has retained five only of the original eight cases—viz. the nominative, vocative, accusative, genitive, and dative; having lost the ablative (the place of which is taken by the genitive) and the locative and instrumental (supplied by the dative case). It, however, like Sanskrit, and unlike Latin, retains the dual as well as the singular and plural numbers. It is, however, by the richness of its verb system that Greek is pre-eminently distinguished. It has three voices—a middle, denoting action as affecting the agent, as well as the active and passive. The statement that, whereas a Latin verb fully conjugated comprises 143 different forms, a Greek verb shows no less than 507, plainly illustrates the comparative resources of the two languages; and this wealth of form corresponds to a proportionate richness and variety of syntactical expression.

The distinctive mark of the language is the number and variety of its vowel sounds; and among them the more musical vowels *a*, *e*, *o* predominate as compared with the thinner sounds of *i* and *u*. Roughly, it may be said that the vowels exceed the consonants in the proportion of fifty per cent.; in English the opposite ratio holds good. Combinations of the vowels give a great variety of diphthongs—viz. *ai*, *au*, *ei*, *ev*, *oi*, *ou*, *yi*, *yu*, *vu*, and *vi*. The only consonants which end a word in Greek are *ν*, *ρ*, *σ*, and *ξ* (*n*, *r*, *s*, and *x*); *ἐκ* alone ends in *κ*. The resulting lightness of termination is another great factor in the euphony of the language. There are evidences of the existence of other letters in older Greek, and in other dialects than Attic. Such are the digamma, *Ϝ* (in sound nearly = English *w*), and the koppa, *Ϙ* (*q*), a velar guttural parallel to the palatal *κ* (*k*).

The original alphabet was, no doubt, adopted from the Phoenicians, though the recent discoveries of a Cretan script at Chnossus and elsewhere make it not impossible that the primary invention of the alphabet was due to the Mycenæans, who imparted it to the Phoenicians, who in their turn passed it on to the Greeks. The oldest specimens of Greek writing known date only from the 7th century B.C. The

Phœnician alphabet, with the addition of the vowel *v*, continued in use in W. Greece down to the 5th century B.C., was adopted by Latin, and through Latin became the model of all the alphabets of W. Europe. In E. Greece, especially in the Ionian colonies in Asia, the alphabet was improved by the addition of the signs ϕ and χ (*ph* and *ch*), ψ (*ps*), Ω (δ), and the use of H (*h*, the rough breathing) for $\tilde{\epsilon}$. This alphabet was adopted at Athens by public authority in 403 B.C., and constituted the regular Greek alphabet.

The earliest Greek writing proceeded, like the Phœnician, from right to left. This was succeeded by a style called *boustrophædon*—i.e. in alternate lines from right to left and from left to right. In both styles the writing often began from the bottom and went upwards. But after 500 B.C. the writing invariably proceeded from left to right, and went from the top to the bottom. About 260 B.C., Aristophanes of Byzantium invented the accents, to assist learners, especially foreigners, in the correct pronunciation of Greek. The acute (´) denotes a rising, the grave (`) a falling tone, and the circumflex (˘) a combination of the two. It is most important to remember that these accents marked musical tone or pitch, and not stress. Originally, every syllable in a word was marked with an accent, one bearing the acute or circumflex, and all the others grave accents. Afterwards the grave accent was assumed, and each word bore only a single accent. The grave is now written only when a final syllable, naturally acute, has its accent changed to a grave when preceding another word. The acute accent can fall on any of the last three syllables of a word, but only on the antepenultimate when the last syllable is short. The circumflex can only fall on long syllables, on one of the last two syllables of a word, and only on the penultimate when the last syllable is short. Verbs, as a rule, throw their accent as far back as possible; but the accentuation of substantives, adjectives, and the other parts of speech follows no fixed rule.

The question of the pronunciation of ancient Greek has been much disputed, chiefly because that of modern Greek in many respects differs entirely from what all the evidences of the ancient language lead us to expect. In modern Greek the vowels and diphthongs η , ι , υ , ϵ , α , υ are all pronounced with the sound of *i* in 'machine,' α is pronounced like ϵ , β is pronounced as υ , and δ as *th* in 'then;' and in every

word the accented syllable is pronounced with so strong a stress-accent that the other syllables are seriously obscured. The improbability that the ancient Greek alphabet would have used the six signs given above to represent the one sound of *i* = ϵ ; the information given by the occasional use in ancient writers of onomatopœic words, and by transliterations into Latin and other languages; the evidence of metrical quantity in all ancient Greek poetry; and the impossibility, considering the distinctness of the final syllables in ancient Greek, of the existence in it of a strong stress-accent, have caused modern scholars with practical unanimity to reject the modern pronunciation for ancient Greek. The scholars of modern Greece unite, however, in maintaining that their pronunciation is the same as that of the ancients. The accent was one of pitch, not of stress; otherwise the distinction of quantity between short and long syllables, so clearly marked not only in Greek poetry but also in prose, must necessarily have been obscured.

In regard to vocabulary, Greek is distinguished above all other languages by its absolute purity and by its wealth of words. It was the Attic dialect which, by reason of the literary predominance of Athens, became the standard form of Greek speech—the form learned by Romans and other foreigners, and taught in modern schools. But Attic was only one among many dialects of ancient Greece. In historical times dialects are classed in three main groups—Æolic, Doric, and Ionic (including Attic). The first group includes the Æolians of Asia Minor and Lesbos, Thessalians, Bœotians, and other north-western Greeks. Its chief characteristics are the frequent dropping of the rough breathing (our *h*) at the beginning of words; substitution of ϵ for υ ; use of υ for α , and of η for ϵ ; the preference of labials to dentals; and the accenting of words on the penultimate or antepenultimate rather than on the last syllable. Doric was used by the Dorians of Sparta, Messenia, Argos, Corinth, and Megara, and by their many colonies in S. Italy, Sicily, Rhodes, Byzantium, and elsewhere. About 500 B.C. it was probably the most widely diffused dialect. Its characteristics are the use of τ for σ between two vowels, the preference of κ to τ in many terminations, the objection to final σ and to σ between vowels, and the accentuation of words on the final syllable. Both Æolic and Doric

retain an original α , which in Attic appears as η , and contract $\alpha\alpha$ to α , not ω . The broad α sound, in particular, marks these dialects; hence the proverbial 'broad Doric.' Ionic was spoken in the Ionian colonies in Asia Minor, in Thrace, in Italy, Sicily, and at Massilia in S. France. It is marked especially by its preference of η to α , and of uncontracted vowels—e.g. $\epsilon\epsilon$, $\epsilon\alpha$, where the Attic would have ϵ and α . The oldest form of this dialect is seen in the Homeric poems; but they contain a literary, not a spoken, language. Attic is sometimes spoken of as a late stage of the Ionic dialect; it is more correct to consider it the development in continental Greece of the primitive form of Greek, whereas the Ionic was the development of the same speech on foreign soil. The Attic dialect reached its perfection between 450 and 300 B.C.; the writings of the Attic tragedians, comedians, historians, philosophers, and orators became familiar throughout Greece; and it became the representative Greek dialect. Its wide diffusion led to the growth of a common form of Greek speech, known as 'the common dialect,' which was diffused throughout the East by the conquests of Alexander and his successors, and which became the current speech of the eastern half of the Roman empire. The forms of this dialect are Attic in the main, with the intermixture of many words foreign to the strict Attic vocabulary.

This 'common dialect' was the language used by the translators of the Septuagint, the writers of the New Testament, authors such as Polybius, Plutarch, Dion Cassius, and the many rhetoricians, historians, and philosophers of the Roman empire. It continued to be used at the Byzantine court until the capture of Constantinople in 1453 A.D. But long previously modern Greek had begun to be developed from the various local dialects. Indeed, tendencies complete in modern Greek show themselves as early as 750 A.D. These tendencies are the dropping of the use of the dative case, and generally the increased use of prepositions rather than of case-endings, the use of auxiliary verbs to express distinctions of mood and tense, and the loss of the infinitive mood and of the middle voice; in fact, the language becomes analytic rather than synthetic. At the same time, the changes in pronunciation mentioned above are introduced; accent predominates to the exclusion of quantity; and final letters, even final syllables, are omitted or obscured

in enunciation. The vocabulary also is corrupted by the intermixture of words from the many races who had conquered and occupied Greece or associated with its people. Thus, words of Latin, Slavonic, Albanian, Turkish, Italian, French, and even English derivation occur in modern Greek. Since the restoration of Greek independence a strong effort has been made by the literary classes in Greece to replace as far as possible such alien words by their ancient Greek synonyms.

Bibliography.—Philological: King and Cookson's *Sounds and Inflections in Greek and Latin* (1888). Grammar and Syntax: Goodwin's *Greek Grammar* (1894), and *Syntax of Greek Moods and Tenses* (1892); Kühner's *Griechische Grammatik* (1890-2); Delbrück's *Syntaktische Forschungen* (1871-88). Alphabet: Kirchhoff's *Studien zur Geschichte des Griechischen Alphabets* (1887). Pronunciation: Blass's *Greek Pronunciation* (Eng. trans. 1890); Arnold and Conway's *Restored Pronunciation of Greek and Latin* (1895). Accents: Chandler's *Practical Introduction to Greek Accentuation* (1882). Dialects: Meister's *Die Griechischen Dialekte* (1882-9); Hoffman's *Die Griechischen Dialekte* (1891-3); Smyth's *The Greek Dialects* (1894). Modern Greek: Jannaris's *Historical Greek Grammar* (1897); Vincent and Dickson's *Handbook to Modern Greek* (1879).

2. **Literature.**—The history of the literature of Greece is divided into three periods: from 1000 B.C. to 529 A.D., the date of Justinian's closing of the schools of Athens—the period of ancient Greek literature; from 529 to 1453 A.D., the date of the capture of Constantinople by the Turks—the period of Byzantine literature; and from 1453 A.D. to the present day—the period of modern Greek literature. Of the first period the first seven centuries comprise what is known as the classical literature of Greece. It is a remarkable fact in the literature of Greece that, roughly speaking, each branch of composition developed, flourished, and decayed before the next arose, and that the great days of poetry were almost over before prose reached its full development.

Epic Poetry.—The oldest form of literature in Greece is epic poetry. It includes all Greek poetry written in the epic metre, the hexameter, thus including didactic and philosophical poems. The hexameter is pre-eminently adapted to the nature of the Greek language, moving with a freedom and variety which the same metre has attained in no other language. Its antiquity is shown by its regular use in the

answers given by the Delphic oracle. It was probably originally used in hymns to the gods; but there are evidences of the existence of poets much older than Homer, who himself tells us of Achilles singing 'lays of heroes,' and of famous bards like Demodocus and Phemius. Other evidences of pre-Homeric poems are the names of Orpheus, Linus, Musæus, and Thamyris, figures half or wholly mythical, whom the ancient Greeks believed to be the earliest poets of their nation. But the history of Greek epic poetry really begins with Homer, whatever his name represents—whether he was an individual, author of both *Iliad* and *Odyssey*; or whether there were two Homers, one author of the *Iliad*, the other of the *Odyssey*, as seems more probable; or whether the name represents a school of poets, who at different times composed various poems at length collected into their present shape. But the perfection of the Homeric poems points to their marking the end rather than the beginning of an age of development: that age was the so-called Mycenaean. For the various aspects of the Homeric question, reference may be made to the article on Homer. The renown of Homer, and the fame which his poems gave to the story of Troy, called forth a number of imitators: these were the Cyclic poets, whose works completed the tale of Troy, dealing with the portions preceding and succeeding the subjects of the *Iliad* and the *Odyssey*. The earliest of these writers, Stasinus and Arctinus, wrote probably in the 8th century B.C. Others were Lesches and Agias, and lastly Euegammon of Cyrene, who wrote about 560 B.C. Several poems were also written on the story of Thebes—a *Thebais* was attributed to Homer—but none of these works are extant. To Homer were also attributed the *Margites*, a satirical poem dating c. 600 B.C.; an epic burlesque, the *Battle of the Frogs and Mice*, a work of late and uncertain date; and the *Homeric Hymns*, short songs in honour of various gods, intended as the preludes to epic recitations at festivals. They contain much good poetry, but are far later in date than Homer, probably all later than 700 B.C. Other later epic poets were Pisander of Samos, who wrote on the deeds of Heracles at an unknown date; Panyasis, the uncle of Herodotus, who also wrote a *Heracleia*, and another poem called *Ionica*; Antimachus of Colophon, who wrote a *Thebais*, a long-winded poem, which, however, gained the approval of Plato and of the Emperor Hadrian; and Chœrilus of Samos,

who wrote a poem called the *Perseis*, on the Persian wars, and attained to the honour of having his poems publicly recited along with those of Homer. These three writers all flourished in the 5th century B.C. Of later epic poets in the strict sense, Apollonius Rhodius with his *Argonautica*, the first poem of which love is the main subject, takes the lead; he flourished between 250 and 200 B.C. Finally, the lamp of epic poetry flickered out in the persons of Quintus Smyrnaeus (400 A.D.); Musæus, who wrote on Hero and Leander; and Nonnus, a Christian writer. The last two date about 500 A.D.

Earlier, however, than all these poets save Homer was Hesiod, whom, indeed, the ancients regarded as Homer's contemporary. He applied the epic metre and dialect to questions of daily life in his *Works and Days*, a work containing some noble thoughts, many vigorous maxims, and vivid pictures of country life, and to theology in his *Theogony*. The *Shield of Heracles* ascribed to him is no doubt spurious, but several other genuine works are lost. He probably lived in the 8th century B.C. In the 6th century B.C., Xenophanes, the founder of the Eleatic philosophy, expounded his views in forcible verse, as did his successor Parmenides (c. 500 B.C.). A much greater poet was Empedocles, also a philosopher, who lived during most of the 5th century B.C. Of later didactic poets only Aratus of Soli need be mentioned (fl. 275 B.C.), who imitated Hesiod in his poem the *Phænomena*; he was highly esteemed at Rome.

Lyric Poetry.—Lyric poets have been taken as including elegiac, iambic, and lyric writers properly so called. In Greece lyrics of a purely personal character were less prominent than public lyrics, songs written to be sung at festivals and other occasions by large choruses to the accompaniment of dance and music. In date the elegiac poets precede. Their metre, the elegiac couplet, consisted of a full hexameter, followed by a shorter one, the pentameter, docked of two long syllables, thus forming a sort of stanza suited for the expression of pointed thoughts. The invention of the metre is assigned to Archilochus of Paros (c. 700 B.C.), as is also that of the iambic. He wrote elegiac, iambic, and lyric poems, and as a poet was of great force and range, famous for the bitterness of his satire. Callinus of Ephesus (c. 720 B.C.) was, however, probably an older poet. He exhorted his countrymen to battle in manly strains, which were closely imitated by

Tyrtæus of Athens and Sparta (c. 650 B.C.). Mimnermus of Colophon represents a different school: his poems treat of life and love with a resigned melancholy. Solon of Athens, again (638-558 B.C.), used the elegy to expound his political opinions. Theognis of Megara (c. 550 B.C.) also expressed political views, mingled with social and personal reflections, in his writings. He again is scarcely a poet, though his expression is vigorous and often elegant. Phocylides of Miletus (fl. 520 B.C.) was famous for his epigrams, and celebrated epigrams are assigned to writers otherwise renowned, as Æschylus, Sophocles, Thucydides, Plato, Demosthenes, and Aristotle.

Of the iambic or satirical poets only three are of importance: Archilochus, who has been already mentioned; Simonides—more correctly Semonides—of Amorgos (fl. 625 B.C.), whose chief fragment is a severe satire on women, but with a serious and lofty purpose; and Hipponax of Ephesus (fl. 540 B.C.), also a violent satirist, and inventor of the metre called Hipponactean.

The lyrical poets proper are far more numerous. First come Terpander of Lesbos (fl. 670 B.C.) and Aleman of Sardis (fl. 630 B.C.), who both settled at Sparta, and composed lyric poetry of every kind. One fragment of the latter is remarkable for its appreciation of nature. In point of date Alcaeus and Sappho, both of Mitylene (fl. 600 B.C.), follow; but their lyrics differ in expressing purely personal passion. As such they have influenced modern lyric poetry more than all other Greeks, though among the Greeks themselves they had little success. Both—above all, Sappho—excel in the vividness of their delineation of emotion, especially of the passion of love. Inferior to them in fire was Anacreon of Teos (560-478 B.C.), a singer of the pleasures of love and wine. His elegance and polish have caused him to be much imitated. But the favourite lyric poets of Greece were those who dealt with passions and emotions of a more national and universal character, and whose verses were aided by musical accompaniment, dancing, and the splendid spectacle of a large chorus on great feast days. Such poets were Arion of Methymna (fl. 600 B.C.), the inventor of strophe and antistrophe; Stesichorus of Himera (630-550 B.C.), who told the ancient myths in choric odes; Ibycus of Rhegium (fl. 540 B.C.), famous for his songs of love; Simonides of Ceos (556-459 B.C.), a poet of great range; Bacchylides of Ceos (c. 510-450 B.C.); and, above all, Pindar of Thebes (521-441 B.C.), in Greek

estimation the greatest of the lyric poets. He wrote several sorts of poems, but only his *Epinicia*, or odes in honour of victory at the national games, survive. The magnificence of his diction, the stateliness of his metre, the depth of his thought, and his religious tone justify his position; but his obscurity causes him—and Bacchylides also, a poet of similar nature, but with more polish and less profundity—to appeal to modern ears less than Simonides, whose odes, with their perfect delicacy of feeling and polish of expression, and epigrams on the heroes of Greece, marked by true Hellenic restraint and dignity, touch the heart of every age. For clearness and finish he is comparable to Tennyson. Of other lyric poets only Erinna and Corinna, the latter the teacher of Pindar, and Timocreon of Rhodes (fl. 450 B.C.) need be mentioned. It is worthy of notice that, with few exceptions, the lyric poets of Greece are natives of the Greek colonies, not of the motherland.

Dramatic Poetry.—It is the peculiar glory of the Greek genius to have invented the drama. It began in the songs sung at rustic festivals in honour of Dionysus. These songs were systematized by Arion; Stesichorus showed how the legends could be told in choric verse; but Thespis of Attica (fl. 550 B.C.) invented drama in the true sense when he introduced an actor as distinct from the chorus, whose function it was to act the adventures of the god described in the songs, and to hold dialogues with the leader of the chorus. Soon other subjects than those of the career of Dionysus were represented. Thespis introduced masks and costumes which enabled his one actor to take several parts. His successors Choerilus, Pratinas, and Phrynichus (all fl. 520-480 B.C.), the last named famous for the first historical play, the *Capture of Miletus*, followed in the same lines. It was Æschylus (525-456 B.C.) who gave its final form to drama by introducing a second actor, thus making the chorus subordinate, and by inventing scenery and stage appliances. A third actor was added by Sophocles (497-406 or 405 B.C.), while Euripides (480-407 or 406 B.C.) made the drama more realistic. These were the three great geniuses of the Attic drama: Æschylus famous for his majesty of thought and language and his deep religious feeling; Sophocles for his perfection in the presentation of his character and in diction, and his genuine Hellenic restraint of tone; Euripides for his naturalness and pathos. But besides these poets there were others

who competed with them in the festivals of Dionysus at Athens, and occasionally with success, such as Ion of Chios, Achaëus of Eretria, and Agathon of Athens. Little is known of their works. In the 4th century B.C. new tragic poets continued to arise, but they appear to have possessed little originality, and to have developed the rhetorical side of tragedy to excess. Theodectes, Chæremôn, and Dionysius I. of Syracuse may be mentioned. After 300 B.C. the tragic drama languished; only plays for reading, like those of Lycophron (fl. 295 B.C.) of Alexandria, were composed. The comic drama had come into life practically at the same time and with the same origin as tragedy; it arose from the practice of indulging in scurrilous abuse at rustic festivals. But not being part of the religious service, it was not at first recognized by the state as tragedy was; for it must be remembered that in ancient Greece the tragic drama was part of a religious observance. Susarion of Megara (fl. 575 B.C.) stood in the same relation to comedy as Thespis to tragedy; Epicharmus (c. 536-446 B.C.) and Sophron (fl. 450 B.C.), both of Sicily, showed how character could be amusingly represented on the stage; but it was at Athens that comedy grew to its full development. Attic comedy falls into three stages—Old, Middle, and New. Of these the Old is the most important. It flourished from 460 to 400 B.C.; its characteristics are violent attacks on individuals, mingled with much brilliant wit, word-play, parody, and coarseness. Magnes, Crates, Cratinus, Pherecrates, and Eupolis are among the names mentioned as comic poets; but all are overshadowed by Aristophanes (c. 450-386 B.C.), whose vigour, imagination, force of satire, and purity of language have never been surpassed. The Middle comedy, dating from 400-335 B.C., differed mainly from the Old in its lack of personal satire. It was a comedy of character and types, of travesty of religious myths, and of parody of tragic plays. Antiphanes (404-330 B.C.) and Alexis (390-284 B.C.) were the chief writers, both distinguished by extraordinary profli- gency. The New comedy, which dates from 335-270 B.C., is a comedy of domestic manners and of social life. Imitated by the Latin comedians, it has furnished the model for modern comedy in all languages. The most famous names are those of Philemon, Apollodorus, Diphilus, and, above all, of Menander (342-290 B.C.), the loss of whose works is one of the greatest suffered by Greek literature.

Alexandrian Poetry.—By 300 B.C. the national life of Greece was practically dead; literature lost its natural inspiration. A new age began, devoted to the study of the literature of the past. With it there sprang up an artificial literature, based on learning, not on natural feeling, and claiming the attention, not of the nation, but of scholars. Of many such poets Apollonius Rhodius, Aratus, and Lycophron have been mentioned. Others were Philetas of Cos (c. 340-283 B.C.), a writer of love poems in elegiacs; Callimachus of Cyrene (c. 310-235 B.C.), who wrote hymns and epigrams, and treated epic subjects in small poems—he was much imitated by the Roman poets; and Herondas, the author of a mime, the recent recovery of which in a papyrus found in Egypt widens our view of ancient literature. Far more important than any of these is Theocritus of Syracuse (fl. 272 B.C.), who lived for some years at Alexandria. Though a poet of learning like the rest, he opened a new vein in his exquisite idylls of shepherd life in Sicily, and in his fifteenth idyll, descriptive of social life at Alexandria. The grace of his verse, the charm of his descriptions, and the naturalness of his characters easily give him the first place among all pastoral poets. With him are closely connected Moschus (c. 150 B.C.) and Bion (c. 100 B.C.), who wrote short poems in the same style, but with less distinction. After the time of Theocritus no great work was produced in Greek poetry; but the Greek anthology contains a vast number of short pieces, from two to some twenty or thirty lines in length, on a great variety of subjects. Some of these epigrams are of the greatest delicacy, both of thought and expression, and reflect most clearly the chief excellences of Greek literary art. Among the numerous authors are Leonidas of Tarentum (c. 250 B.C.), Antipater of Sidon (2nd century B.C.), and Meleager of Gadara (1st century B.C.), who began the collection so-called, and lastly, Agathias (6th century A.D.), who may be called the last voice of ancient Greek poetry.

Prose Literature.—The earliest prose writers of Greece, such as Pherecydes of Syros, Cadmus of Miletus, Acusilaus of Argos, and Dionysius, Xanthus, and Charon of Miletus, all dating from the 6th or early 5th century B.C., were chroniclers, of whose works only few fragments remain, and of whom little is known. Hecataeus of Miletus (c. 550-480 B.C.) is a more distinct figure. Better than Herodotus he deserves the title of 'father of history;' but

his works are lost. He was the first to apply rational criticism to popular beliefs. Herodotus of Halicarnassus (c. 490-420 B.C.) is the first great Greek historian. His history of the Persian wars, embracing by way of episode all then known history and much geographical speculation, is extremely valuable as a storehouse of facts, charming in its naive simplicity of style, and artistic in its unity of subject, but he appears to have been often misled by his authorities. Hellanicus of Mitylene was a younger contemporary of his. His chief work, not now extant, was a history of Attica. Ctesias (fl. 400 B.C.) also wrote a Persian history. His position as physician to Artaxerxes enabled him to consult Persian records, and he claims to refute Herodotus; but the latter is better supported by contemporary evidence. Only fragments of Ctesias survive. In the same period Ion of Chios and Stesimbrotus of Thasos wrote the earliest known memoirs of public men. All the writers above mentioned wrote in the Ionic dialect, in a style unaffected by art, though possibly, as in the case of Herodotus, highly artistic in their simplicity. Early in the 5th century B.C., however, a school of rhetoric had arisen in Sicily, headed by Corax and Tisias, and developed by Gorgias of Leontini (490-390 B.C.), who first used a variety of rhetorical figures, and consciously aimed at composing artistic prose. His influence strongly affected Attic writers, especially Thucydides (c. 471-400 B.C.), the first of Attic historians both in date and rank, and the first of critical historians. His *History of the Peloponnesian War* is the greatest historical work of antiquity, distinguished by the author's care in collecting evidence, his impartiality, his political insight, his grasp of historical causation, and his vividness of description. Xenophon (c. 429-355 B.C.) continued the history of Thucydides, which was left unfinished, and wrote various other short historical pieces. Compared with Thucydides, his work fails in elevation both of style and thought, and is disfigured by a strong Spartan bias. Antiochus of Syracuse (fl. 450 B.C.) and Philistus of Syracuse (c. 435-356 B.C.) wrote respectively on Italian and Sicilian history; Ephorus of Cume (c. 380-320 B.C.) wrote a universal history down to 340 B.C., based on criticism, not on research; and Theopompus of Chios (376-320 B.C.) wrote a continuation of Thucydides and a history of Philip II. of Macedon. Both were pupils of Isocrates, and famous for their ease of style. Timæus of Sicily (352-256 B.C.) wrote a Sicilian

history notable for its thoroughness of research. Outside the classical period fall Euhemerus (c. 300 B.C.), who explained divine legends by the theory that the gods were mortal men, worshipped after their death; Polybius (205-123 B.C.), the historian of Rome, the equal of Thucydides as a philosophical historian, but far his inferior in style; Diodorus (fl. 30 B.C.), author of a universal history; Dionysius of Halicarnassus (fl. 25 B.C.), the historian of early Rome; Plutarch (46-120 A.D.), the author of the *Lives of Famous Greeks and Romans*, who was not a scientific historian, but had an unrivalled appreciation of character; Arrian (fl. 140 A.D.), the historian of Alexander; Appian (fl. 160 A.D.), who wrote on Roman history. For the modern world Greek historical literature is contained in Herodotus, Thucydides, Xenophon, Polybius, and Plutarch.

The practice of oratory among the ancient Greeks arose from the necessities of the law court and the public assembly in democratic states: thus it is said that Corax and Tisias, already mentioned, found scope for their art in the many litigations caused by the expulsion of the tyrants from Sicily about 460 B.C. About the same period arose the Sophists, who professed to be general educators of mankind, but who in practice turned their chief attention to rhetoric. Famous Sophists, such as Gorgias, Protagoras, Prodicus, Thrasyarchus, and others, greatly developed the rhetorical art. It was particularly at Athens, the chief democratic state of Greece, that eloquence was of importance; and in Greek literature only the ten Attic orators—the classification is due to the Alexandrian critics—need to be considered. The earliest of these is Antiphon (c. 480-411 B.C.), who was not a speaker himself, but wrote speeches for others, as was the case with several of the other orators. His style is marked by a severe dignity. He was followed by Andocides (fl. 410 B.C.), a natural orator rather than a rhetorician; Lysias (fl. 400 B.C.), a speech-writer, famous for his easy grace of style; Isæus (fl. 360 B.C.), a close and careful reasoner; and Isocrates (436-337 B.C.), whose works exhibit the climax of the rhetorical development of Greek prose style. Although he wrote partly speeches for clients, his chief works were political orations addressed to the whole of Greece, but meant to be read, not heard. He also taught many pupils, and through them largely formed the prose style of later Greek, and eventually, through Cicero, that of

modern Europe. Aeschines (389-314 B.C.), was a much more powerful orator, whose effects were due to nature rather than art. His rival, Demosthenes (384-322 B.C.), was the greatest orator of Greece. To all the command of rhetorical artifice possessed by his predecessors he added a natural force and vehemence which knew when to disregard the rules of art; and he was master alike of all the various styles, dignified, simple, and polished. In him, of all orators, natural genius and painstaking study were harmoniously and fully combined. His greatest efforts are his political speeches, but he also wrote speeches for clients in private suits. Of the remaining orators, Lycurgus (fl. 340 B.C.), and Hyperides (fl. 330 B.C.), were able political speakers; while Dinarchus (fl. 310 B.C.) was a writer of speeches for trials in court. He is the last of the great Greek speakers whose oratory is marked by a careful study of form and elaborate preparation. In fact, to the ancient Greeks beauty of form in speech was as indispensable as in sculpture or painting. Schools of rhetoric continued to flourish; the Attic style was superseded by the Rhodian. Under the Roman empire rhetoricians dealt with set themes, not with the living questions of politics and law—e.g. Dion Chrysostom (fl. 100 A.D.), Herodes Atticus (fl. 130 A.D.), Aristides (fl. 170 A.D.), and others. The death of Greek independence at Cheronæa in 338 B.C. was also the death of Greek oratory.

Philosophical speculation and historical inquiry both arose in ancient Greece about the same period—the earlier half of the 6th century B.C.; but from the literary aspect, no philosopher before Plato is of importance. Enough is known of the doctrines of Thales, Anaximander, and Anaximenes, all of Miletus (fl. 600-550 B.C.), of Pythagoras (fl. 530), of Heraclitus of Ephesus (fl. 500), of Anaxagoras (fl. 450), and of Democritus (fl. 400), to give them importance in a history of philosophy; but their writings have ceased to exist, except in scanty fragments. Some works, however, which can be safely ascribed to Hippocrates of Cos (c. 460-400) are extant, and though they are medical, their terse and forcible style gives them rank as literature. Socrates, the greatest thinker of Greece, and the founder of moral philosophy, only taught by word of mouth. But he inspired many disciples—as, for example, Euclides of Megara, Aristippus of Cyrene, and Antisthenes the Cynic, of Athens, who all were active in the earlier half of the 4th century B.C. But

the greatest by far of the Socratics was Plato (420-348 B.C.) of Athens, whose works excel all other philosophical writings in literary quality. Regarded as literature, they are remarkable for their dramatic setting, their close observation of character, the vivacity of their conversation, the grace and delicacy of their language, the poetic fancifulness of imagination, and the loftiness of moral tone they exhibit. Aristotle (384-322 B.C.) of Stagira, the pupil of Plato, and the only other old Greek philosopher whose writings exist in anything like completeness, though possibly more important than Plato in philosophy, is far inferior to him as an artist in language. The more finished of his works, such as the *Politics* and *Ethics*, have at times a kind of epigrammatic force, but on the whole they disregard style. Theophrastus (372-287 B.C.), the successor of Aristotle, is known best by an extant work on *Characters*, showing close observation and much humour, but lacking in style. Of the other great philosophers, Zeno, Cleanthes, and Chrysippus, the Stoics, and Epicurus, no complete works remain. Only the works of Epictetus (fl. 100 A.D.), as arranged by Arrian, and the *Meditations* of Marcus Aurelius (121-180 A.D.) require mention, until we come to the time of the Neo-Platonists, Plotinus, Iamblichus, and Porphyrius, in whom Greek philosophy degenerated into mysticism, and whose writings are devoid of literary quality. Diogenes Laertius (fl. 200 A.D.) may be mentioned under this head, as his *Lives of the Philosophers* contains much valuable information about many of those named in this section.

Miscellaneous Literature.—The great literary prose of Greece, with one or two exceptions, has been treated in the three preceding sections; but after the decay of original creative genius, there succeeded generation after generation of scholars, who did much to collect and systematize knowledge of the past. Pre-eminent among these were the schools of Alexandria and Pergamon, under the patronage respectively of the Ptolemies and the Attalids. But neither school produced much that can properly be classed as literature; the poetry of the Alexandrian age has already been mentioned, and the contemporary prose works were mainly learned compilations, dealing with questions of scholarship, criticism, grammar, rhetoric, geography, and the like. The names of Zenodotus (c. 325-234 B.C.), Eratosthenes (c. 276-195 B.C.), Aristophanes (c. 257-180 B.C.), and Aristarchus (c. 215-145

B.C.), the first four librarians at Alexandria, were all famous for their Homeric studies, and Eratosthenes for his works on geography and mathematics. Of the Pergamene school, Polemon (fl. 190 B.C.) wrote on Greek topography, Demetrius (fl. 160 B.C.) on the topography of the Troad, and Crates (fl. 150 B.C.) on grammar and literary criticism. More interest is to be found in the extant works on literary style of Dionysius of Halicarnassus (fl. 20 B.C.), and of Demetrius (date unknown), on the same subject. The geographical work of Strabo (fl. 20 B.C. to 20 A.D.), Pausanias's (fl. 170 A.D.) work on Greek archaeology and topography, the rhetorical works of Philostratus (fl. 215-245 A.D.), and the *Deipnosophistæ* of Athenæus (fl. 240 A.D.), contain much valuable information. The treatise *On the Sublime*, which is usually ascribed to Cassius Longinus (fl. 270 A.D.), but is probably of much earlier date, deserves to be reckoned among the great productions of Greek genius. Here, too, belongs Lucian (c. 125-192 A.D.), of Samosata in Syria, who wrote in Attic Greek with a correctness of diction and a delicacy and elegance of touch which few native Greeks ever excelled. His numerous writings, mainly satires on contemporary philosophy and religion, are remarkable for the brilliancy of their imagination and the playfulness of their wit. Mention, however, should also be made of the Greek romances, the forerunners of the modern novel. Xenophon of Ephesus (fl. 250 A.D.), Heliodorus, Longus (both fl. c. 400 A.D.), and Achilles Tatius (fl. 500 A.D.) are the four chief novelists whose work survives. Of them Longus excels in literary and poetic quality; Heliodorus in construction of plot and narrative power. His romance, the *Æthiopica*, is a true love story, full of hairbreadth escapes and exciting adventures. This last new spring of Greek literature was choked, like all its other fountains, by 'barbarism' and Christian intolerance.

With regard to ancient Greek literature, it must be remembered that, considerable as are its extant remains, far more has been lost. Of ancient epic poetry, Homer alone exists; of the lyric poets, only Theognis, Pindar, and Bacchylides present complete poems; of the tragic dramatists we have only thirty-three plays out of three hundred composed by the three great writers, and none of the many other tragedians; the eleven plays of Aristophanes alone exist of the hundreds, or possibly thousands, produced by the many writers of the Old, Middle, and New comedy; most of the poetry of the Alexandrian

age is gone; Herodotus, Thucydides, Xenophon, and Polybius are but four of many Greek historians; oratory is better represented; but philosophy can only show the works of Plato and Aristotle out of the hundreds written by philosophers of every school; and of the many productions of ancient scholarship not one in a hundred survives. The vast quantity of the ancient stores is shown by the fact that in the 1st century B.C. the Alexandrian library is said to have contained 700,000 volumes, while that of Pergamon contained 200,000. The loss of the writings of Archilochus, Alcaeus, Sappho, Simonides, and Menander cannot be estimated. The most marked characteristic of Greek literature generally is its perfection of form: it appeals to the ear as much as to the mind. At first, no doubt, it was addressed solely to the ear, as was always the case with dramas and speeches; but it is also possible that the Greek habit was always to read aloud, so that the sound never ceased to be as important as the sense. This external perfection of form is balanced in the best authors by an internal perfection of harmony and restraint; the imagination and passions are never allowed to run wild; the prevailing tone is one of sanity and soberness. Again, the interest is almost exclusively human; still, Greek literature does not descend to the photographic minuteness of so-called realism.

Byzantine Literature.—The study of ancient Greek literature and the writing of works in ancient Greek continued at Byzantium from 529 A.D. to 1453 A.D., but no works of permanent literary value were produced. There are histories, such as those of Procopius (fl. 527–562 A.D.), Constantine Porphyrogenitus (905–945 A.D.), Zonaras (fl. 1120 A.D.), Laonicus Chalcondyles, Ducas, Phrantzes, and Critobulus (all fl. 1450 A.D.), who are valuable merely as authorities; and scholars like Photius (c. 820–890 A.D.), Suidas (fl. 960 A.D.), Tzetzes (1110–80 A.D.), Eustathius (fl. 1175 A.D.), whose works contain much useful information collected from lost authorities.

Modern Greek Literature.—Except a few popular songs, nothing that can be called literature existed in modern Greek before 1200 A.D., nor can it be said that there had been many works of note composed until the 19th century. Many folk-songs and ballads, however, of great merit exist, and have been collected; and about 1370 an epic poem *Belthandros and Chrysantha* was produced. From about 1600 there dates another epic, the *Erotocri-*

tos, by Vincenzo Cornaro of Crete. About the same time Georgios Chortakis, also of Crete, wrote a drama, the *Erophile*. Other notable poets are Rhegas (1754–98), who wrote the famous song translated by Byron; Christopoulos (1770–1847), called the 'modern Anacreon'; two brothers, Panagiotis (1800–63) and Alexander (1803–63) Soutzos, the former famous for his plays, the latter for his satire. There are many other later poets, such as Angelos Vlachos and Achilles Paraschos, both dramatists. In prose literature the chief names are those of A. R. Rhangabé (1810–92), who composed works on grammar, history, art, and literature, as well as novels and histories; Tricoupis, the historian of the revolution; the novelist Stephanos Xenos; and the writers of short stories, Bikelas and Psichari. Many modern Greek authors have preferred to compose their works in French, German, or English, to reach a wider audience. Of those who write in modern Greek, the prose authors and some of the poets adopt the literary language, while the poets on the whole prefer the vernacular, the spoken language of the people.

See Mure's (1860), Mahaffy's (1895), and Jevons's (1886) *Hist. of Greek Literature*; Croiset's *Littérature Grecque* (1887–99); Christ's (1889), Bernhardt's (1892), and Bergk's (1894) *Griechische Literaturgeschichte*; Symonds's *Studies of Greek Poets* (1893); Haigh's *Tragic Drama of the Greeks* (1896); Jebb's *Attic Orators* (1892), and *Growth and Influence of Greek Poetry* (1893); Süsemihl's *Geschichte der griechischen Literatur in der Alexandrinerzeit* (1892); Krumbacher's *Geschichte der Byzantinischen Literatur* (2nd ed. 1897); Rohde's *Der griechische Roman* (2nd ed. 1900); and for modern Greek literature, Rhangabé's *Histoire Littéraire de la Grèce Moderne* (1877), Nicolai's *Geschichte der neugriechischen Literatur* (1876), Geldart's *Modern Greek Language* (1870), Lamber's *Poètes Grecs Contemporains* (1881), and Felton's *Selections from Modern Greek Writers* (1857).

Greek Archipelago, the islands in the Aegean Sea, over which Greece claims authority. They number about 300. Euboea and the Sporades lie to the N.E., and are 2,216 sq. m. in area; their population is over 115,500. Of the Sporades the only one worthy of note is Skyros. The Cyclades in the S.E. are volcanic in origin, and number some 200. They are 923 sq. m. in area; their population numbers 134,750. The most important are Naxos and Santorini, Milos, Seriphos, and Paros.

Greek Church. Under the name of the Greek Church are classed a group of churches which, adhering to the decrees of the first seven Œcumenical Councils, do not acknowledge the bishop of Rome's supremacy. The term 'Greek' merely recalls the early history of these churches, and is inappropriate for a body of which hardly two per cent. are Greeks, or use the Greek language in their liturgy. They themselves use the title of the 'Oriental Orthodox Church,' or, more fully, the 'Holy Oriental Orthodox Catholic Apostolic Church.' Of the 105,000,000 members of the joint Greek Church some 87,000,000 belong to the Russian Church, and use the Old Slavonian tongue in their liturgy. Next in point of numbers, and richest in historic memories and traditions, is the Orthodox Church in Turkey, ruled by the patriarch of Constantinople, with the subordinate patriarchs of Alexandria, Antioch, and Jerusalem. There are about 3,000,000 Christians in the whole Ottoman empire. The National Church of Greece has about 2,000,000 members, and is governed by a Holy Synod, but is more independent of the state than is the Russian Church. In Serbia and Roumania there are national branches of this church, the members of the former numbering over 2,250,000, and of the latter nearly 5,500,000; and to these must be added nearly 250,000 members of the Orthodox Greek Church in Montenegro, and nearly 3,500,000 in Austria-Hungary. The National Church of Roumania dates from 1861, and is governed by the primate of Roumania, the archbishop of Moldavia, and six bishops. The Orthodox Greek Church in Serbia has a broken history reaching back to the year 1300, but the existing organization dates only from 1830. The Serbian Church is governed by a synod of bishops, presided over by the archbishop of Belgrade; but all alike are subject to the authority of the minister of public worship. The Bulgarian Church has also now a separate patriarchate, and some 3,000,000 members. On the other hand, the 'United Greeks,' who are scattered throughout Turkey, Hungary (2,000,000), Austria (3,000,000), and Russia (9,500,000), are in communion with the Church of Rome, though they retain some specifically Greek practices, such as the use of Greek and of unleavened bread, communion in both kinds, and married clergy. Finally, there is an inconsiderable group of Greek, or rather Oriental, schismatic bodies—Nestorians, Jacobites, Ansarihs, etc.—who differ in doctrine, especially in

Christology, from both the Greek and Latin Churches, and have separate organizations.

History.—The separation of the Latin and Greek Churches may be traced to the founding of Constantinople and the political division of the Roman empire. Already in 481 we note an estrangement between the Latin and Greek Churches, which lasted until 519. It was not, however, until the 9th century that the 'great schism' began. Ignatius, patriarch of Constantinople, had been deposed, and was succeeded by the learned Photius, who convoked a council of the East (867), and passed sentence of excommunication on the bishop of Rome. He denounced as heresy the Latin addition to the creed of the phrase *Filioque*, as also the Saturday fast of the Romans, their use of milk and cheese at the great fasts, and their prohibition of priestly marriage. But Photius was deposed (869) and Ignatius restored by Basil, the new emperor, and a temporary peace was concluded. In 878 Ignatius died, and Photius, resuming the patriarchate, once more excommunicated the Romans. Eight years afterwards he was again deposed by a new emperor (Leo), and died in 891, and the churches were reunited until the middle of the 11th century. In the meantime Russia had been converted and added to the Greek Church. In 1054 Michael Cerularius, patriarch of Constantinople, renewed the condemnation of the Latins for their special practices, and was in turn excommunicated by Pope Leo IX. Michael at once withdrew the Eastern bishops from communion with Rome, and the schism was reopened. The pressure of the Turks induced the Greeks to favour reunion, and efforts were made in 1098, 1168, and 1201, but they were violently opposed by the mass of the Greek clergy and people. At the council of Lyons in 1274 a union was effected, but it only lasted six years, and at Ferrara (1439) the Greek prelates again signed a decree of union, but were forced by the people and clergy to repudiate it.

The Russian Church was founded when, in 1582-9, the patriarch of Constantinople instituted a patriarch of Moscow, who was recognized by all the Easterns as the fifth patriarch of the Orthodox Church. Its independence was completed by the constitution of the permanent Holy Synod in 1721. In 1833 the Greek bishops in turn declared their independence of Constantinople, and organized a permanent Holy Synod, like that of Russia, which was recognized by the patriarch of Constantinople in 1830. In 1870 the Bulgarians formed themselves

into a separate patriarchate. These various branches of the Eastern Church are one in their attachment to dogma as defined by the first seven councils, and their resistance to Western innovations. Pope Pius IX. made several fruitless attempts to secure a reunion, and the Vatican decrees of 1870 intensified the aversion of the Orientals.

Constitution.—In each branch of the Oriental Church the higher clergy consist of patriarchs, archbishops, and bishops. The patriarch of Constantinople, who has precedence of the patriarchs of Alexandria (with about 20,000 subjects in Egypt, Libya, Nubia, and Arabia), Antioch (30,000 in Cilicia, Syria, Mesopotamia, Isauria, etc.), and Jerusalem (15,000 Greeks living about the holy places), is assisted by a synod of twelve metropolitans and a national council with a strong lay element. The bishops appoint the lower clergy. Celibacy is obligatory for the higher clergy. In Greece the synod is composed of a bishop-president and four other elected archbishops or bishops, and is independent of the state. In Russia the Czar is head of the church, and political motives enter largely into its work. The lower clergy, who may marry (once), are assisted by an elaborate organization of officials in minor orders.

Dogma and Cult.—The Orthodox Oriental Church celebrates a special festival at the beginning of Lent as 'Orthodox Sunday.' There has been no constructive theologian in the East since St. John of Damascus. The difference from Rome in respect of belief is mainly one of development. The only point on which there is emphatic disagreement is the manner of the procession of the Holy Ghost. The Greeks maintain that He proceeds from the Father alone, and their dislike to the Latin addition of the phrase *Filioque* to the Nicene creed has ever been the chief obstacle to reunion. Apart from this, and the primacy and infallibility of the Pope (as well as the authority of the later councils), they agree with the Roman Catholic Church in doctrine.

The cult of the Orthodox Church is even more elaborate, gorgeous, and symbolical than that of the Church of Rome. The daily mass is the chief function, and for this they use the ancient liturgy of St. Chrysostom, with an occasional change to that of St. Basil. On Saturdays and Sundays they celebrate a mass of the pre-sanctified (or mass with a host previously consecrated), as the Roman Catholics do on Good Friday. The liturgical language is Greek in Turkey

and Greece, Old Slavonian in Russia, Old Georgian in Georgia, and the native tongue in the churches of the farther East. They practise auricular confession, but the institution has not the importance that it has in the Latin Church. The sermon was entirely neglected until recent years. It is now heard regularly at Athens, and the custom is growing in Russia. They have the worship of the saints and their relics, but statues, crucifixes, and all images in relief are forbidden; the cross and the picture only are allowed in the cult. They fast on Wednesdays and Fridays, and on the great fasts they abstain from fish, eggs, milk, cheese, wine, beer, and oil, as well as meat. The use of organs or musical instruments is forbidden. Other differences from the Roman ritual are: the threefold immersion in baptism, the giving of baptism and confirmation together, the communion in two kinds and the use of leavened bread, the administration of the sacrament to infants, the anointing of the sick for hygienic purposes, and the erect and eastward posture during prayer.

See King's *Rites of the Greek Church in Russia* (1772); Schmitt's *Kritische Geschichte der Neu-Griechischen und Russischen Kirche* (1840); Mouravieff's *Hist. of the Church of Russia* (Eng. trans. 1842); Pitzpios's *L'Eglise Orientale* (1835); Neale's *Hist. of the Holy Eastern Church* (1850-73); Dean Stanley's *Lectures on the Hist. of the Eastern Church* (new ed. 1883); Blackmore's *The Doctrine of the Russian Church* (1845); Goar's *Euchologium, seu Rituale Græcum* (1647); Pichler's *Geschichte der kirchlichen Trennung zwischen dem Orient und Occident* (1864); Gass's *Symbolik der Griechischen Kirche* (1872); Kattenbusch's *Die Orthodoxe Anatolische Kirche* (1883); Howard's *The Schism between the Oriental and Western Churches* (1892); Bois's *Le Dogme Grec* (1893); Horton's *Student's Hist. of the Greek Church* (1902).

Greek Fire was invented in the year 668 by Callinicus of Heliopolis. That it was a liquid composition we are led by Gibbon to infer from the various modes of using it, whilst other writers describe it as a solid substance. It was chiefly employed on board ship, and was thrown by large engines on the enemy, or poured over the walls of a besieged place. It was undoubtedly very combustible, and possibly the prototype of gunpowder. See *The United States Service Magazine* (January 1864), where the subject is fully treated, and in which paper the suggestion is made that naphtha was the basis of the composition.

Greeley, HORACE (1811-72), American journalist and politician, was born at Amherst, New Hampshire. He took to journalism, and established his reputation as editor of the *New Yorker*, the *Jeffersonian*, and the *Log Cabin* (1833-40). He founded the *New York Tribune* in 1841, which soon acquired great influence in the northern and western states. Greeley was one of the first advocates of the emancipation of the slaves, and it is said to have been through his influence that Lincoln issued his emancipation proclamation. Nevertheless, he was not vehement enough to please the abolitionists, so that he incurred the dislike of both sides in the controversies that preceded the civil war. On the conclusion of peace, he further lost popularity by advocating universal amnesty and universal suffrage, and by offering himself as bail for Jefferson Davis (1867). Throughout his life Greeley was active in his efforts for the amelioration of the condition of the working-classes, and was a staunch advocate of protection. Among his works are *Hints towards Reforms* (1850); *History of the Struggle for Slavery Extension* (1856); *The American Conflict* (1864-6); *Recollections of a Busy Life* (1869). See also *Lives* by Jas. Parton (1855; new ed. 1872), L. U. Reaves (1872), L. D. Ingersoll (1874), and Zabriskie (1890).

Greeley, ADOLPHUS WASHINGTON (1844), American meteorologist and Arctic explorer, born at Newburyport in Massachusetts; served in the Northern army in the civil war (1861-4), and in 1868 was appointed to the signal service, the head of which he became in 1887. In 1881 he was selected to command the American Arctic expedition, which in conjunction with twelve others formed a circumpolar chain of scientific stations for meteorological and other observations. The expedition penetrated to the then farthest N. lat. of 83° 24' (Brainard and Lockwood), crossing Grinnell Land. When rescued by the third relief expedition at Cape Sabine (Payer Harbour) in the summer of 1884, the party, reduced to seven, was on the point of perishing of hunger. Greeley described the expedition in *Three Years of Arctic Service* (1885). He has also written *Proceedings of the Lady Franklin Bay Expedition* (1888); *American Explorers* (1894); *Handbook of Arctic Discoveries* (1896); and books on the climates of various American states. He also edited *Public Documents of the First Fourteen Congresses, 1784-1817* (1900).

Green, JOHN RICHARD (1837-83), English historian, born at

Oxford. Relinquishing clerical work (1869), he became librarian at Lambeth, and devoted himself to literature. His *Short History of the English People* appeared first in 1874 (illust. ed. in 4 vols. 1892-4); *A History of the English People* (1877-80). In 1877 he married Alice Stopford, who helped him in his work, and wrote herself *Henry II.* (English Statesmen, 1888), and *Town Life in the 15th Century* (1894). In spite of ill-health Green produced *The Making of England* (1881); *The Conquest of England*, completed by his wife after his death, appeared in 1883 (3rd ed. 1899); *Stray Studies from England and Italy* (1876; 2nd series, entitled *Stray Studies*, 1903); *Readings from English History* (1879); *Addison's Select Essays* (1881); *Studies in Oxford History* (1901); *Oxford Studies*, ed. by Mrs. Green and Miss K. Norgate (1901); and *Historical Studies* (1903). The Oxford Historical Society and the *English Historical Review* owed their inception to him. He was selected by Mrs. Humphry Ward as the model for her *Robert Elsmere* (1888). Green's special merit is that he conceived history as the story of the people and their social development. His archaeological and geographical lore combine with his historical insight to impart vividness and value to all his work, and his style became more sober and correct in his later productions. See Mrs. Green's Memoir, prefixed to the *Short History* (ed. 1888), and *Letters of J. R. Green* (ed. Leslie Stephen, 1901).

Green, MARY ANNE EVERETT (1818-95), English historian, was born at Sheffield, went to London in 1841, and in 1845 married George Pycock Green (d. 1893), artist. She edited the *Diary of John Rous* for the Camden Society (1856); the *Life and Letters of Queen Henrietta Maria* (1857); and from 1857 edited more than forty volumes of *Calendars and Domestic State Papers* belonging to the reigns of the Stuart period, beginning with James I.

Green, SETH (1817-88), American pisciculturist, was born at Rochester, New York, and having carried out numerous experiments in the artificial propagation of fish, was able to supply many American rivers with salmon, trout, and shad. He published *Trout Culture* (1870); and *Fish Hatching and Fish Catching* (1879).

Green, THOMAS HILL (1836-82), English philosopher, was born at Birkin, a Yorkshire village. He was in 1878 appointed Whyte's professor of moral philosophy in the University of Oxford. The lectures which he delivered during his four years' tenure of

the chair became the material of a book, *Prolegomena to Ethics*, published (1883) after his death. His other works were collected in 3 vols. and edited, with a memoir, by R. L. Nettleship (1885-8); but it is by his *Prolegomena* and by his searching introductions to the two vols. of an edition of *Hume's Treatise on Human Nature* (1874) that he is best known. His philosophical position, though sometimes described as Hegelian, is in reality much more Kantian in character, and where he develops Kant's teaching it is on different lines. Kant had shown that experience, whether of the physical or of the moral world, depends upon the nature of mind; that both knowledge and morality imply for their explanation reason or intelligent consciousness as their subject and author, and so are incapable of being explained on the basis of a non-intelligent or merely animal consciousness. But while for Kant mind or reason in this connection signifies only a certain type of logical structure which distinguishes human from animal experience, Green treats it as an entity, one and the same in all its manifestations; and hence he speaks of a divine or eternal consciousness, which reproduces itself in man, and in virtue of participation in which alone man is a rational and moral being. For a criticism of Green's metaphysics, see A. Seth Pringle-Pattison's *Hegelianism and Personality* (1887); and of his ethics, see H. Sidgwick's *Ethics of T. H. Green* (1902). For a popular exposition, see Fairbrother's *The Philosophy of T. H. Green* (1896).

Greenaway, KATE (1846-1901), English illustrator, designer, and verse writer, celebrated for the charming freshness and originality of her drawings of children. She was born in London, and her earliest work appeared in *Little Folks* (1873). In 1873 she began her celebrated series of Christmas cards for Marcus Ward. *Under the Window* was published in 1879, followed by *A Birthday Book for Children*, *Mother Goose*, *A Day in a Child's Life*, *Little Ann*, *Language of Flowers*, *Mavor's Spelling Book*, *A Painting Book*, *Alphabet*, *The Pied Piper*, and finally, in 1901, *The April Baby's Book of Tunes*. She was a member of the Royal Institute of Painters in Water-colours (1890). See Spielmann and Layard's *Kate Greenaway* (1905).

Greenbacks are treasury notes issued by the United States government, and are so called because the back of the note is printed in green ink. These notes were issued during the civil war in three issues of

\$150,000,000 each, in February and July 1862, and March 1863; and at the close of the war a portion of the issues was withdrawn. But this policy of redemption created so much opposition that in 1878 a law was passed forbidding the treasury department further to reduce the amount in circulation on January 1, 1879, which was \$346,681,016. The amount issued had been largely in excess of the commercial needs of the country, and in consequence prices rose. A cheap money party among the farmers of the west and south was one of the results of this artificial enhancement of prices. This party was organized for political purposes in 1874 as an independent Greenback party, which at three successive elections nominated candidates for the presidency.

Green Bay, city, Wisconsin, U.S.A., the co. seat of Brown co., at the head of Green Bay, 110 m. N. of Milwaukee. It has a fine harbour, and a large trade in lumber and fish. Mineral springs have made it a popular summer resort. Pop. (1900) 18,684.

Greenbush. See RENSSELAER.

Green Cloth, BOARD OF, so called from the table at which the lord steward of the royal household usually sat. This office has control over the kitchen, cellars, and household generally, and is located at Buckingham Palace, London. The old and oppressive jurisdiction of the palace in the 'verge of court' was abolished in 1849.

Greene, MAURICE (?1696-1755), English composer of church music, and collector, born in London, was organist of St. Dunstan-in-the-West (1716), St. Paul's Cathedral (1718), the Chapel Royal (1727), professor of music in the University of Cambridge (1730), and a founder of the Royal Society of Musicians (1738). His works show the influence of Handel, whose friendship he lost by siding with Buononcini in the famous quarrel between the two. He left *Forty Select Anthems*, a *Te Deum*, several *Oratorios*, and *Catches and Canons for Three and Four Voices*.

Greene, NATHANIEL (1742-86), American general, was born in Warwick co., Rhode I. After distinguishing himself at Trenton and Princeton, he, between 1777 and 1781, fought many successful actions against the British, and his retreat before Lord Cornwallis was skilfully conducted. In 1780 he was given the command of the southern army, and he soon rendered fruitless the victories of Lord Cornwallis and the capture of Charlestown. The last hopes of the royalist party in the south were crushed when

Greene, after being successively defeated at Guilford Court-house and Hobkirk's Hill, won the decisive battle at Eutaw Springs in 1781, and followed up his success with such energy as to drive the British out of S. Carolina. See F. V. Greene's *General N. Greene* (1893), and G. W. Greene's *Life of N. Greene* (1867-71).

Greene, ROBERT (c. 1560-92), English dramatist and pamphleteer, was born in Norwich. By 1580 he had begun a busy literary life in London. Besides plays for the Queen's and other companies of actors, he wrote a number of pamphlets, of which the best are in a vein of sentimental romance, and often contain exquisite pastoral and lyric verse. Many of his later writings are semi-autobiographical. One (*Groat's Worth of Wit*) is famous as containing an attack upon the growing dramatic fame of Shakespeare. Plays: *Orlando Furioso* (1594); *Looking Glass for London and England* (with Lodge, 1594); *Frier Bacon and Frier Bongay* (1594); *James IV.* (1598); *Alphonsus, King of Aragon* (1599); *George a Greene, the Pinner of Wakefield* (1599). Collected works: ed. A. Dyce (plays only, 1831, 1861); ed. A. B. Grosart (complete, 15 vols. 1881-6); ed. *Plays and Poems*, by J. Churton Collins (1905). See *Life* by N. Storozhenko (Eng. trans. in Grosart, vol. i.). Selections: *Green Pastures*, ed. A. B. Grosart (1894).

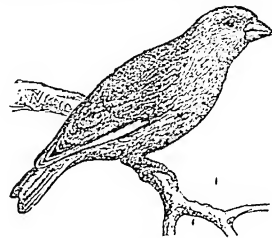
Greene, SIR WILLIAM CONYNGHAM (1854), British diplomatist, was born in Ireland. He has filled appointments at Athens (1880), Stuttgart (1883-7), the Hague (1889-91), Brussels (1891-93), and Teheran, where he was secretary of legation and *chargé d'affaires* (1893-96). Then he was British agent at Pretoria before the outbreak of the Boer war (1899-1902). In 1901 he was appointed British minister to Switzerland, and in 1905 was transferred to Bucharest.

Green Earth, a soft, earthy, green secondary product, which is found in cavities and veins of basaltic igneous rocks. It is an impure form of chlorite, and has resulted in most cases from the decomposition of pyroxene. It is a ferrous silicate and aluminium, but cannot be said to have any very definite composition.

Greenfield, tn., cap. of Franklin co., Massachusetts, U.S.A., near the Connecticut R. It has manufactures of table cutlery, tools, and machinery. Pop. (1900) 7,927.

Greenfinch, or **GREEN LINNET** (*Ligurinus chloris*), a common British bird found chiefly in wooded districts. It becomes very tame in confinement, and

interbreeds both with the canary and the goldfinch. The general tint of the male is olive-yellow above and yellow below, but there is considerable variation in colour.



Greenfinch.

Greengage, a plum grown for dessert purposes, not quite so hardy as many of the plums, and should therefore be given a sheltered spot in the fruit garden. The culture is the same as for plums.

Greenheart, BIBIRI, or BE-BEERU (*Neotandra Rodiei*), is a tree of British Guiana, the timber of which is held in high repute for shipbuilding. The wood is also used, on account of its great strength and elasticity, in the manufacture of fishing-rods. The bark, known generally as bebeeru or bibiri, yields an alkaloid with tonic and febrifugal properties somewhat similar to those of cinchona.

Greenhouse. See HOTHOUSE.

Greenland, an island-continent in the Arctic seas. It is separated from the N.E. coast of British N. America by Baffin Bay and Davis Strait, and stretches from Cape Farewell (lat. 59° 45' N.) up to Cape Britannia, a short distance from the 83rd parallel. Length, N. to S., 1,600 m.; greatest breadth, E. to W., 700 m.; area, 680,000 sq. m. The interior is covered with an immense shield-shaped mantle of ice, rising to from 8,000 to 10,000 ft., which here and there sends out glaciers to the sea, especially on the W. coast, between lat. 68° and 75° N. The narrow fringe of exposed land is intersected by numerous deep fiords (Scoresby Fiord on the E. coast penetrates 180 m. inland), and in some places rises into peaks of considerable height, such as Petermann Peak in Franz Josef Fiord, from 8,000 to 9,000 ft. high. Iron is found in large masses on the basalts of Disko I., but the only mineral of economic importance is cryolite, which is worked at Ivigtut in the Arsuk fiord (61° 40' N. lat.). All round the coast are former shore lines, at altitudes ranging from 250 to 500 ft. above the present sea-level. The temperature of Greenland is arctic.

Greenland was first discovered

(about 870), according to the *Landnámabók*, by Gunnbjörn. More than a century later another Icelander, Erik the Red, visited the country, naming it Grönland to induce people to settle there, and about 986 he founded two colonies at what are now Godthaab and Julianehaab. In 1721 the missionary Hans Egede landed at the mouth of the Godthaab fiord. In 1733 the first Moravian settlement was founded at Ny Herrnhut, near Egede's houses. In 1900 Andrup completed the survey of the S.E. coast by traversing the section between 69° and 67° N. lat., so that now only the N.E. part, from Cape Bismarck to Independence Bay, is still unknown. Norden-skiöld and Peary made expeditions over the inland ice from Disko Bay in 1883 and 1886 respectively; Nansen crossed from sea to sea in 1888, and Peary explored the N. coasts in 1892, 1895, and 1898-1902, ascertaining the insular character of the continent. A Danish expedition under official approval, which was dispatched in June 1903 to investigate exhaustively the manners, customs, beliefs, superstitions, and folklore of the people, has now returned. The Danish colonies extend along the W. coast from about 60° to 72° N. lat., and are grouped into two inspectorates—S. Greenland (cap. Godthaab), and N. Greenland (cap. Upernavik). The population consists of Eskimos, a large proportion of half-breeds, and a few Danes. The Duke d'Orléans expedition to Greenland in the *Belgica* (May to September 1905) obtained some interesting results, notably the discovery that the extreme N.E. point of Greenland is an island. In June 1906 M. Mylius Erichsen sailed from Copenhagen on an expedition to N.E. Greenland.

The true Greenlanders are the Inuit (see ESKIMO); but these have been so much associated for generations with people of Danish stock that pure Eskimos are most likely to be found in the less frequented districts. The natives of Angmagsalik are of unmixed Eskimo blood. What may be regarded as the ancient Eskimo type is represented by the skulls discovered by Scoresby junior in native graves at Neill's Cliffs (70° 30' N. lat.; 22° 35' W. long.), in all of which 'it was remarked that the chin was very prominent, and the forehead greatly retreating.'

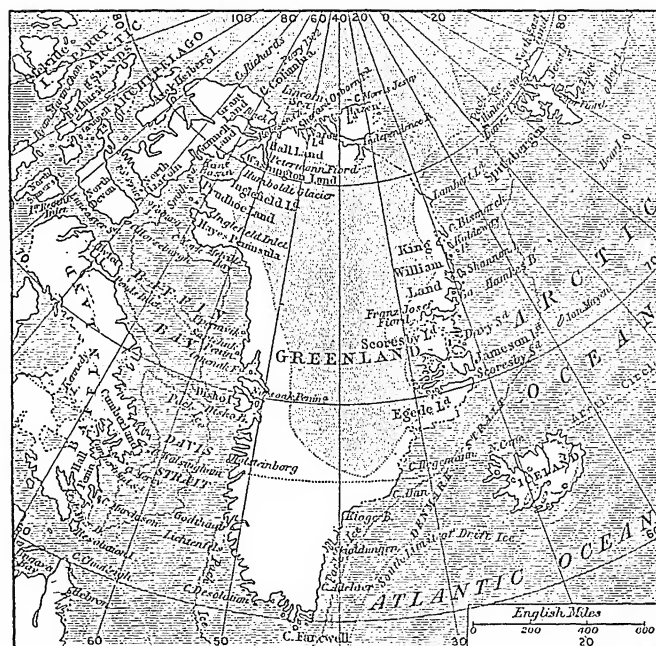
The trade has been a government monopoly since 1774. About 10,000 barrels of oil, mostly seal, 30,000 seal-skins, 1,400 blue and 1,200 white fox-skins, and a small quantity of cider down are exported annually. Total trade,

about £70,000 annually, of which two-thirds are imports. Pop. of Danish Greenland (1901) 11,893. See Rafn's *Antiquitates Americanae* (1837), for earliest references; Hans Egede's *Greenland* (Eng. trans. 1845); Rink's *Danish Greenland* (Eng. trans. 1877), *Tales and Traditions* (Eng. trans. 1875), and *Eskimo Tribes* (1891); Möller and Berthelsen's *Grönlandske Folkesagn*, in Danish and Eskimo (1859-61); Morillot's *Mythologie et Légendes des Esquimaux de Greenland* (1874); G. Holm's *Sagn og Fortællinger fra Angmagsalik* (1888 and 1902); Carstensen's *Two Summers in Greenland* (1890); and Wright and

2,500 fathoms, but W. of Jan Mayen it is only about 1,000 fathoms deep. Its width between Norway and Greenland is 700 m. The E. Greenland Polar current from the Polar sea runs S. along the E. coast of Greenland. There are great variations of temperature.

Green Muds. See GLAUCONITE.

Greenock, seapt. tn. and parl. bor., Renfrewshire, Scotland, on the S. bank of the Clyde, 22 m. W. of Glasgow. The public buildings include the renaissance town hall (1886), with a tower 245 ft. high; the McLean Museum (1876); the Watt Institute (1837); the post office (1899);



Greenland.

Upham's *Greenland Icefields* (1896), for interesting general account, though the principal source for this is the series *Meddelelser om Grönland* (1879, etc.); Nordenskiöld's *Grönland* (Leslie's Eng. trans. 1879); Nansen's *First Crossing of Greenland* (Eng. trans. 1891); Peary's *Northward over the Great Ice* (1898), and the Peary Arctic Club Reports, U.S., for exploration and discovery.

Greenland Sea, the most westerly of the three branches of the Arctic Ocean, lies between Spitzbergen (N.), Norway, Jan Mayen, Iceland, and Greenland (S.). Midway between Greenland and Spitzbergen it goes down to

and a free library (1901). The harbour works date from 1707, and include four basins, the James Watt dock (1886), and the Garvel graving-dock. Shipbuilding is the chief industry, and there are sugar and glucose refineries, iron foundries, spinning-wool, aluminium rolling, and paper mills. In 1905 the imports were valued at £1,257,568, and the exports at £783,889. It returns one member to Parliament. The town is the birthplace of James Watt (1736-1819), Principal John Caird (1820-1898), and Hamish MacCunn, musical composer (b. 1868). John Galt, novelist, and Burns's Highland Mary are buried here. Pop. (1901) 68,142.

Greenore, fishing vil., N.E. of Co. Louth, Ireland, on Carlingford Lough. Pop. 300.

Greenough, GEORGE BELLAS (1778-1855), English geographer and geologist, in 1807 founded the London Geological Society, of which he was the first president. Many years of his life were devoted to preparing geological maps of England and Wales, also of British India. He was also president of the Royal Geographical Society (1839-40), and author of *Critical Examination of the First Principles of Geology* (1819).

Greenough, HORATIO (1805-52), American sculptor, born in Boston. While at Harvard he designed the Bunker Hill monument. After 1825 he spent most of his life in Italy, but executed (1843) for Congress the colossal statue of George Washington in front of the Capitol, and a group of four historical figures called *'The Rescue'*, also placed in Washington, as well as busts of Quincy Adams, Webster, Clay, etc. His work is characterized by lofty inspiration and faultless accuracy in detail. See Tuckerman's *Memorial of Greenough* (1853), and *Letters* (ed. F. B. Greenough, 1887).

Green Point, suburb of Cape Town in Cape Colony.

Green River. (1.) River of U.S.A., one of the two main forks of the Colorado of the W. It rises in the Wind River Mts. in W. Wyoming, and flows generally S. to its junction with the Grand in S.E. Utah, cutting heavy cañons through the Uinta Mts. Its length is 720 m., and its drainage area 47,220 sq. m. (2.) Large tributary of the Ohio, U.S.A., rising near the centre of Kentucky, and flowing W. and N.W. through the W. coal field of Kentucky to join the Ohio on its l. bk. Its length is 300 m.

Greenroom, the waiting-room close to the stage used by actors during intervals; so called from the original colour of its walls, etc., green being an antidote to stage-glare. Formerly it was often made a scene of disorder by dandies and idlers. Macready introduced reforms, adopted and extended by the Bancrofts and other modern managers. See *The Secret History of the Greenrooms*,..... in *the Three Large Theatres* (1790-93: vol. i. Drury Lane; vol. ii. Covent Garden; vol. iii. The Haymarket).

Greensand, in geology, a subdivision of the Cretaceous system, which consists typically of fine or coarse sands, usually more or less coherent, mixed with a varying quantity of glauconite (to which it owes its frequently green colour). It represents generally

a period of transition from shallow, fresh-water conditions to typical clear, open seawaters. The Greensand is divided into Upper and Lower, and these are not continuous, as between them the calcareous clay of the Gault intervenes. The Greensand (with the Gault) can be traced around the Weald of Kent from Folkestone to Eastbourne, lying at the base of the chalk downs of Surrey and Sussex; and rising into a series of low hills (such as Leith Hill), it forms very picturesque, rolling country. In the west of England beds of the same age form the Blackdown Hills, and they extend also across England from the south coast near Bridport in a northeasterly direction to Hunstanton in Norfolk. After crossing the Wash they run north through Lincolnshire into Yorkshire, where they emerge on the seashore near Speeton (Bridlington). The whole of these beds are rich in fossils, many of which are well known.

Greensand beds occur in the north of Ireland and on both the east and west sides of Scotland, and pass from England across the Channel into France. Glass sands, fuller's earth, brick clays, and sandstones for building and road mending are their principal products. In some districts in Cambridgeshire and elsewhere they contain many phosphatic nodules, the so-called 'coprolites,' valuable for the manufacture of artificial manures.

Greensboro, city, N. Carolina, U.S.A., the co. seat of Guilford co., 75 m. by rail N.W. of Raleigh. It produces tobacco and fruit, and has iron and copper mines and blast furnaces. Here are the Greensboro Female College (1846), Bennett College, and the State Agricultural College. Pop. (1900) 10,035.

Greensburg, city and co. seat of Westmoreland co., Pennsylvania, U.S.A., 31 m. by rail S.E. of Pittsburg; manufactures glass and iron. Pop. (1900) 6,508.

Greenshank (*Totanus canescens*), one of the sandpipers, distinguished by the greenish colour of the legs and feet.

Green Sickness, an almost obsolete term for the disease now known as chlorosis or anemia.

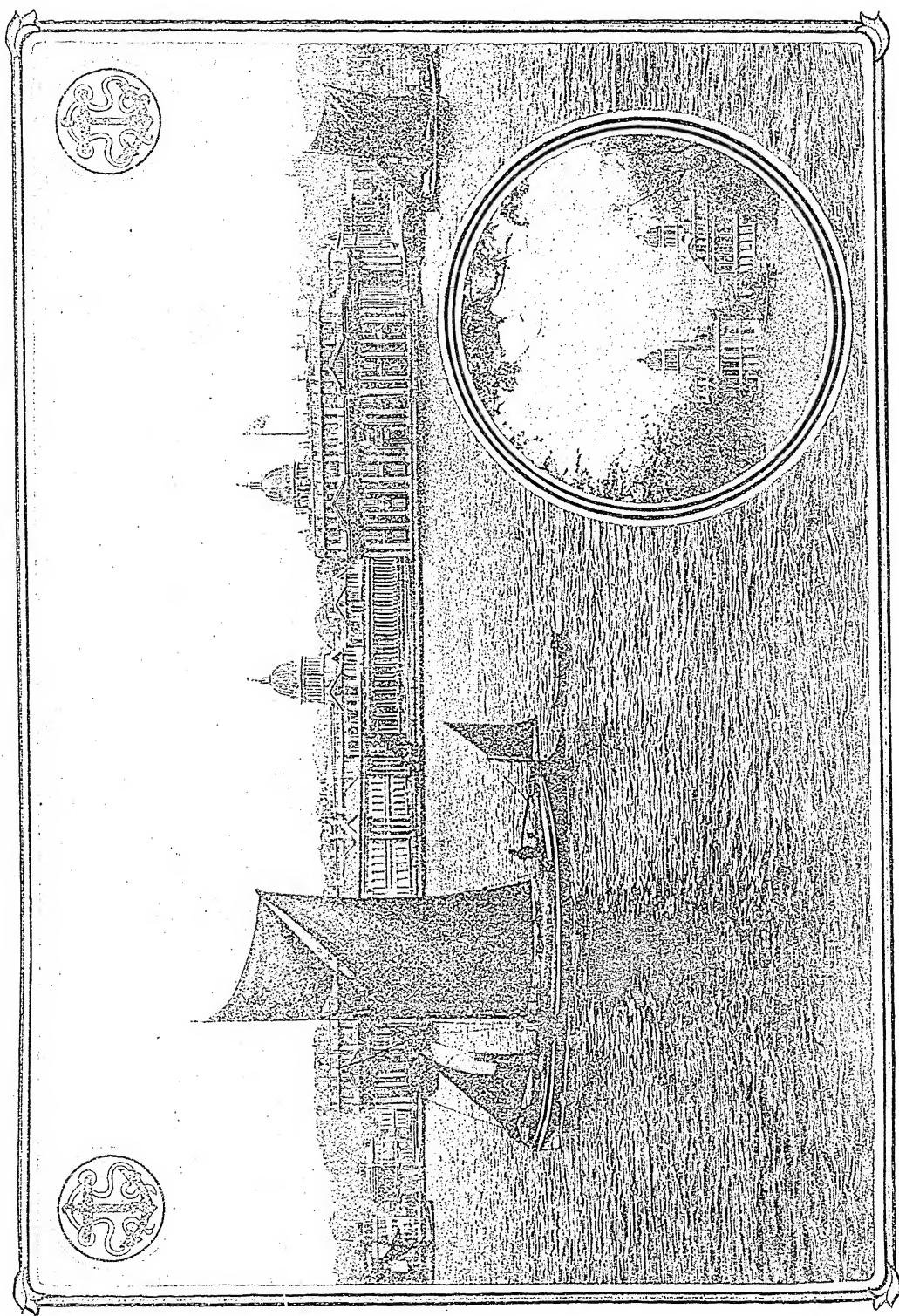
Greenstone, a name formerly given to weathered basic igneous rocks, such as basalt, diabase, dolerite, and gabbro, because they become dark green on account of the development of chlorite and serpentine from their pyroxene and olivine. It has now been replaced by more exact names, which are founded on the mineralogical composition of the unaltered rocks as determined by means of the microscope.

Greenville. (1.) Town, Mississippi, U.S.A., the co. seat of Washington co., on the Mississippi, 95 m. N.W. of Jackson. Its cotton trade is of considerable importance. Pop. (1900) 7,642. (2.) City, S. Carolina, U.S.A., the co. seat of Greenville co., 100 m. N.W. of Columbia. It manufactures cotton. Here are Furman University (1852), Greenville Female College (1854), Greenville College for Women (1894), and Chicora College (for women). Pop. (1900) 11,860. (3.) City, and co. seat of Hunt co., Texas, U.S.A., 56 m. N.E. of Dallas. It has a cotton trade. Here are Burleson College and Holiness College. Pop. (1900) 6,860.

Greenwell, DORA (1821-82), English religious poet and essayist, was born at Greenwell Ford, in Durham. Her religious thought and its expression have a depth and delicacy which led Whittier to class her with such writers as Thomas à Kempis, Tauler, and Fénelon. She published volumes of poems in 1848, 1850, and 1861, followed by *Carmina Crucis* (1869), *The Soul's Legend* (1873), and others. *The Patience of Hope* (1800); *Two Friends* (1867), and its sequel *Colloquia Crucis* (1871); *Essays* (1866); a *Life of Lacordaire* (1867), and a memoir of John Woolman (1871), are among her prose works. See *Memoirs* by William Dorling (1885); and J. G. Whittier's preface to the American edition of *The Patience of Hope* (1862).

Greenwich. (1.) Metropolitan and parl. bor., co. of London, England, 5 m. S.E. of London, on the Thames, is famous as the seat of the Greenwich Hospital and the Royal Astronomical Observatory. The latter, built in 1675, is situated in lat. 51° 28' 38" N., and is the point through which the first meridian passes, from which longitudes in English-speaking countries are measured. The observatory sends each day by wire the correct time to the principal towns in the United Kingdom, hence called 'Greenwich time.' The ministerial whitebait dinner to celebrate the close of a parliamentary session was in vogue (with breaks) since the end of the 18th century, but has recently fallen into disuse. Greenwich returns one member to the House of Commons. Pop. (1901) 95,757. (2.) Town, Fairfield co., Connecticut, U.S.A., on Long Island Sound, 28 m. N.E. of New York; is a summer resort and residential suburb of New York. Pop. (1900) 12,172.

Greenwich Hospital was founded in 1694 by King William and Queen Mary. As far back as 1300 the palace of Greenwich was a favourite residence of royalty;



Greenwich Hospital, from the River and from the Park.
(Photos by G. W. Wilson and Spooner & Co.)

and it was later the birthplace of Henry VIII., Queen Mary, and Queen Elizabeth. The building had been enlarged by Edward IV., and later by Henry VIII., who gave it the name of Placentia. At the restoration of Charles II. the old palace was pulled down, and a new building erected in its place. In addition to the half-completed palace buildings, eight acres of land were in 1694 given over for the relief of disabled seamen. Two thousand pounds a year were voted from the public funds, and these were further increased by the Register Act of 1696, by which 6d. a month and other less sums were deducted from all seamen's pay. The most valuable acquisition, however, was that of the forfeited estates of the Earl of Derwentwater, producing over £20,000 a year. A curious legacy, amounting to £10,000, was left to the hospital early in the 18th century by a man who called himself 'A friend of the navy.' Other sources of income were the rents of Greenwich market, and of houses there and in London.

After 1735 merchant seamen were admitted for a time. The funds of the hospital, besides providing pensions for officers and men of the navy, support a large boys' school at Greenwich; provide for the maintenance of other boys at orphanages, schools, and other institutions; and for the maintenance of girls at schools; and supply partial maintenance to sons and daughters of deceased or distinguished officers, and allowances to widows, children, and parents of seamen and marines.

The Greenwich pensions for seamen, as at present arranged, are known as age pensions, or special pensions. The former are fivepence a day for a man over fifty years of age, and ninepence a day for a man over sixty-five. The special pensions are awarded in varying amounts to men who are not able to contribute materially to their own support, and may be held in addition to other pensions.

Greenwich Royal Naval College, an Admiralty school of advanced professional education in nautical and kindred subjects. It has occupied the greater part of the Royal Hospital at Greenwich since 1873. It is open to officers of the navy, the royal marines, the Indian marine, and the merchant service. Government students of naval architecture are also admitted, as well as private students of naval architecture and engineering. Limited numbers of fleet, staff, and chief engineers are annually admitted for one session. Students in naval construction, after five

years at the Keyham training college, are admitted to the R.N. College as probationary assistant-constructors for one year. The naval officers of superior rank who are allowed to attend partly optional courses at the college during any year are twenty-five captains and commanders (not more than five of each being on full pay), thirty-five lieutenants, two officers of the R.M.A. and six of the R.M.I., and a few naval instructors.

Greenwood, FREDERICK (1830), English journalist and publicist, was first editor of the *Pall Mall Gazette*, which he originated in February 1863; and it was he who first learned that the Suez Canal shares held by the Khedive of Egypt were about to be sold to a French syndicate. He waited upon Lord Derby at once, and on Dec. 25, 1875, it was announced that the British government had purchased the Khedive's 177,000 shares for four millions sterling. When the *Pall Mall Gazette* was acquired by Mr. Yates Thompson early in 1880, Mr. Greenwood started the *St. James's Gazette*. This he continued to edit for several years, and subsequently founded the *Anti-Jacobin*, which had, however, only a short career. Mr. Greenwood's publications include *Louis Napoleon Bonaparte, Emperor of the French (1853)*; *Life of Napoleon III. (1855)*; *The Lover's Lexicon (1893)*; and *Imagination in Dreams, and their Study (1894)*. One of his novels, written somewhat in the manner of Dickens, appeared in *The Welcome Guest*; while another, which was published anonymously in *Cornhill*, excited considerable discussion as to its authorship.

Greet, BEN, English actor-manager, has organized several companies of 'Woodland Players' to give outdoor Shakespearean representations in London and the provinces. In connection with Mr. William Poel, its founder (1896), he has worked for the Elizabethan Stage Society, especially in the production of the impressive morality play *Everyman*. Mr. Ben Greet acts in his own companies, and has long been known in Britain and in America for Shakespearean, Elizabethan, old English, and modern English interpretations.

Greg, WILLIAM RATHBONE (1809-81), English author, was born at Manchester. He entered business in 1828, and retired in 1850. He then devoted his leisure to writing on religious and political subjects. He also held a commissionership in the Customs (1856-64), and was comptroller of the Stationery Office (1864-77).

His chief works are *The Creed of Christendom (1851)*, *Enigmas of Life (1872)*, and *Rocks Ahead (1874)*. Greg was an agnostic, with a leaning towards theism; in politics, his ideal was the rule of an aristocracy of character and ability.

Gregale, a cold, desiccating, unhealthy wind from the north-east, which blows over Malta in spring and early summer.

Gregarina, a parasitic protozoan, found within the alimentary canal of various arthropods, such as the lobster, cockroach, and so on. The adult has the single cell which constitutes the body enveloped in a firm articular sheath, and has no mouth, food being apparently absorbed by the whole surface. Reproduction occurs by spore-formation, which may or may not be preceded by the conjugation of two individuals. The spores are formed within a protective cyst, which ultimately bursts to free the spores. To the sub-class Gregarinida belong many allies of gregarina, which are common parasites of invertebrates. The majority do not appear to inflict serious injury upon their hosts. To the same class, however (Sporozoa), belong some dangerous parasites of man—e.g. the organism of malaria.

Grégoire, HENRI (1750-1831), French statesman and ecclesiastic, born at Vého, near Lunéville. In the States-general (1789) he led that portion of the clergy who sided with the Third Estate, and took an important part in effecting the formal abolition of the royal power (1792), though he endeavoured to prevent the execution of the king. He did much for the cause of education in France, and most of the works of art in Paris which survived the vandalism of the reign of terror owe their safety to him. In him, combined with a wide sympathy towards all who laboured under any disability—as, for example, the Jewish nation and the negro tribes—was a strong republicanism which made him a persistent opponent of Napoleon's later imperialist policy. Among his works, which are mainly historical, his *Mémoires (1837)* are of especial interest. See biographical notice by Carnot in Grégoire's *Mémoires*; also *Lives* by Krüger (1838) and Böhlinger (1878).

Gregorian Calendar. See CALENDAR.

Gregorian Chant. See INTONATION and PLAIN-SONG.

Gregorovius, FERDINAND (1821-91), German historian and poet, was born at Neidenburg, E. Prussia. His first work, *Goethe's Wilhelm Meister in seinen sozialistischen Elementen (1849)*, attracted some attention. A historical drama, *Der Tod des Ti-*

berius, appeared in 1851. Travels in Italy and Corsica bore fruit in a volume entitled *Corsica*, which has been translated into English (1883-4); a collection of papers, *Wanderjahre in Italien* (5 vols. 1856-77); and *Die Insel Capri* (1868; 3rd ed. 1897; Eng. trans. 1896). His epic *Euphronion* (1858) shows a true classical spirit. Of another book, *The Tombs of the Popes* (1857; 2nd ed. 1881), there has (1903) appeared an English translation. His chief historical work is his *History of Rome in the Middle Ages* (Eng. trans. 1894-1900), though his *Lucrezia Borgia* (3rd ed. 1875; Eng. trans. 1904) and *Geschichte der Stadt Athen im Mittelalter* (2nd ed. 1889) are also noteworthy.

Gregory, the name of sixteen popes.

The first was GREGORY THE GREAT (590-604), born about 540 at Rome; was appointed by Justin the younger governor of the city (574). Upon the death of Pelagius II. (590) he was fixed upon as his successor. The temporal sovereignty of the popes dates from his pontificate, for Gregory ruled over the patrimony of the church with both ability and equity. Under his influence Spain renounced heresy and embraced the Roman Catholic faith. His writings include *Liber Pastoralis*, translated into Anglo-Saxon by King Alfred; and *Dialogues* (Eng. trans. in *Little Flowers from St. Benedict*, 1901). In the history of music his name is associated with the chants of the Roman Catholic Church, with the modes or tones upon which this is constructed, and with the notation in which it is now written—in the last case, however, erroneously, as some maintain. His works have been edited by the Benedictines, with biography (1705). See *Life* by Kellest (1889), Snow (1892), Duddens (1905), and Abbot Gasquet (1904).

GREGORY II. (715-731) was born in Rome c. 669; succeeded Constantine, effected the conversion of the heathen in Bavaria, forbade monks to marry, and in 718 gave to the Englishman Winfrid (whose name he changed into Boniface) his commission to preach in N. Germany.

GREGORY VII. (1073-85), known as Hildebrand before he occupied the papal chair, was one of the most celebrated of the popes. He was born in Tuscany in 1020, and after studying at Clugny became famous as a preacher. From the time he accompanied Pope Leo IX. to Rome, in 1049, down to his death, he exercised a controlling influence upon the policy of the papacy. Upon being deposed (1076) by the Emperor Henry IV. because of his prohibition of imperial investitures,

Gregory retaliated by excommunicating the emperor, and finally compelled him to do penance barefoot for three successive days at Canossa in 1077. But Gregory was himself deposed in favour of Clement III. by Henry (1080), who besieged and captured Rome; but the Pope was liberated by Robert Guiscard, and retired to Salerno, where he died. See *Lives* by Gfrörer (1859-64), W. R. W. Stephens (1886), Dolare (1889-90), and Vincent (1896).

GREGORY IX. (1227-41), the successor of Honorius III., was born at Anagni, his pontificate being a long struggle between the Guelphs and the Ghibellines. He excommunicated the Emperor Frederick II. for refusing to engage in a crusade. On the emperor advancing to besiege Rome, Gregory died, broken-hearted, nearly a hundred years of age. He instituted the Inquisition. See *Life*, in Italian, by Balan (1872-3); and a monograph, in German, by J. Marx (1890).

GREGORY X. (1271-6), a Visconti, born at Piacenza in 1210, accompanied Edward, Prince of Wales, to Palestine. As Pope he is famous for his crusade in relief of the Holy Land, for his reconciliation of the Greek and Latin Churches, and for his promulgation at the Council of Lyons in 1274 of the constitution of the conclave to regulate the election of succeeding popes.

GREGORY XI. (1370-8) was born at Limoges in France; succeeded Urban V., and transferred the papal see from Avignon back to Rome in 1377.

GREGORY XIII. (1572-85), born at Bologna in 1512, was sent by Pope Pius IV. to the Council of Trent. He assisted the Jesuits in every part of the world, and their college at Rome owed its establishment to him. In the same city, in 1581, he founded the English college, and in 1582 promulgated the reform of the Julian calendar, the 'New Style,' which was at once adopted by all Roman Catholic countries. He expressed approbation of the massacre of St. Bartholomew, sent Campian and other Jesuits to England, and approved the league in France against Henry IV.

GREGORY XIV. (1590-1), born at Cremona in 1535, is chiefly known as the Pope who excommunicated Henry IV. of France, and aided Philip II. of Spain with money and troops.

GREGORY XV. (1621-3), born at Bologna in 1554, succeeded Paul V., and assisted the Emperor Ferdinand II. against the Protestants, and the king of Poland against Sweden. He canonized Francis Xavier, Ignatius Loyola, Philip of Neri, and others; founded the congregation *De Propaganda Fide*;

and promulgated regulations, still in force, for the election of the popes.

GREGORY XVI. (1831-46), born at Belluno in 1765, succeeded Leo XII. in 1831. Although he encouraged literature and the fine arts, he was perhaps the most narrow-minded of the popes. He strenuously denounced all commercial, agricultural, and industrial amelioration, all ecclesiastical reformation, all theological development. The only matter on which he cast a favourable eye during his pontificate was the fostering of Jesuitism. He was the author of *The Triumphs of the Papacy* (1799). See *Life*, in German, by Wagner (1846), and, in French, by Sylvain (1889); also Cardinal Wiseman's *Recollections of the Last Four Popes* (1858).

Gregory, a Scottish family famous at Aberdeen and Edinburgh in medicine and science.

(1.) JAMES (1638-75), born at Drumoak, near Aberdeen; invented the Gregorian reflecting telescope in 1661, and described it in his *Optica Promota* (1663). From 1664-7 Gregory prosecuted his studies at Padua, and there printed his *Vera Circuli et Hyperbolæ Quadratura* (1667) and other geometrical works. Returning to Scotland, he was chosen (1669) professor of mathematics at St. Andrews, and in 1674 first mathematical professor in Edinburgh University.

(2.) DAVID (1661-1708), nephew of James, born at Aberdeen; succeeded his uncle in the chair of mathematics, Edinburgh, when twenty-three years old. He supported, and was the first publicly to lecture on, the Newtonian philosophy, and was appointed Savilian professor of astronomy at Oxford. He was the author of *Exercitatio Geometrica de Dimensione Figurarum* (1684); *Astronomiæ Physicæ et Geometricæ Elementa* (1702), a favourite text-book; mathematical lectures, published in Maclaurin's *Treatise of Practical Geometry* (1745); and he brought out a splendid edition of Euclid (1703).

(3.) JOHN (1724-73), grandson of James, born at Aberdeen; became professor of medicine at Aberdeen (1755) and at Edinburgh (1766), and lecturer on physic in both universities. He was the author of *Elements of the Practice of Physic* (1772), and *A Comparative View of the State and Faculties of Man and the Animal World* (1765). See *Life* prefixed to Gregory's *A Father's Legacy to his Daughters* (1788).

(4.) JAMES (1753-1821), eldest son of John, born at Aberdeen; succeeded (1776) to his father's chair at Edinburgh, and became (1790) professor of the practice of medicine. He wrote two vol-

umes of *Philosophical and Literary Essays*, and *Conspectus Medicinæ Theoreticæ* (1780-2), which established him as the leading consultant in Edinburgh. He compounded 'Gregory's powder,' and was a great controversialist.

(5.) WILLIAM (1803-58), son of James, born at Edinburgh; was professor of chemistry at Glasgow (1837), Aberdeen (1839), and Edinburgh (1844) universities successively. He was a pupil of Liebig; translated some of his works, and was author of *Outlines of Chemistry* (1845). For history of the whole family, see *Famous Scots Series: The Academic Gregories* (1896).

Gregory, St. (3rd and 4th centuries), called 'the Illuminator,' the apostle of Armenia; said to have been descended from the Arsacide, the royal race of Parthia and Armenia. His father having assassinated the king of Persia, all the family were murdered except Gregory, who was taken to Cæsarea and brought up a Christian. Returning as missionary to Armenia (c. 286), he was confined in a pit for fourteen years. Finally he healed the king of an affliction, and secured the establishment of Christianity as the religion of the country. See C. S. Malan's *Life and Times of Gregory the Illuminator* (Eng. trans. 1838).

Gregory Nazianzen, St. (c. 330-339), one of the greatest of ecclesiastical orators, was born at Arianus in Cappadocia, and studied at Cæsarea in Palestine, at Alexandria, and for ten years with St. Basil and Julian (afterwards emperor) at Athens. In 372 Basil was made bishop of Sasima in Cappadocia. In 378 he was persuaded to take up the orthodox cause at Constantinople, and was elected archbishop. This provoked such violent opposition on the part of the Arians that he preferred to resign, and returned to Asia (381). He has left an autobiographic poem, with other poems, sermons, and letters. These were edited by the Benedictines at Paris in 1778-1842; and selections from them appear in vol. vii. of the *Nicene and Post-Nicene Fathers* (1893). See C. Ullmann's *Gregory of Nazianzum* (Eng. trans. 1851), H. Weiss's *Die drei grossen Kappadocier* (1872), and A. Benoit's *Saint Grégoire de Naziance* (2nd ed. 1885).

Gregory of Nyssa, St. (4th century), a younger brother of St. Basil, born at Cæsarea in Cappadocia. After being a teacher of rhetoric, he was in 372 compelled by Basil to accept the bishopric of Nyssa, near Cæsarea. The Arians persecuted him for his support of Nicæa, and in 375 convened a synod, which deposed

him for contumacy. Restored in 378, at the death of Valens, he took a prominent part in the Œcumenical Council at Constantinople (381). Gregory of Nyssa was a copious writer, and the chief speculative theologian of 'the three great Cappadocians.' His chief work is the *Twelve Books against Eunomius*. Nearly all his writings are given in Migne's *Patrologia Græca*, xlv.-xlvii.; new ed. Forbes (1855-61). There is a selection in vol. v. of the *Nicene and Post-Nicene Fathers* (1893). See J. Rupp's *Gregors, des Bischofs von Nyssa, Leben und Meinungen* (1834); S. P. Heyns's *Disputatio de Gregorio Nysseno* (1833); H. Weiss's *Die drei grossen Kappadocier* (1872).

Gregory of Tours, St. (538-594), the 'father of French history,' born at Arverni (now Clermont-Ferrand) in Auvergne. Elected bishop of Tours (573), he was much harassed in the civil wars, in which he sided with Sigbert against Chilperic. His chief work, the *Historie sive Annalium Francorum libri x.*, is the main authority for the history of Gaul in the 6th century. He is credulous, partial to the ecclesiastical cause, and sometimes inaccurate when borrowing from others, but is without an honest and valuable chronicler. The best edition is that of Arndt and Krusch (1884-5). All his works are in Migne's *Patrologia Latina*, lxxi. See L. B. des Francs's *Études sur Grégoire de Tours* (1862); Löbell's *Gregor von Tours und seine Zeit* (2nd ed. 1869).

Gregory Thaumaturgus, St. (210-270 A.D.), born at Neocæsarea in Pontus, studied under Origen (in 233) for some years. Returning to Neocæsarea, he was elected bishop (240). There is a *Life* of him by Gregory of Nyssa. His writings are in Migne's *Patr. Gr.*, x., and *Ante-Nicene Fathers*, vi. (1886-96). See Ryssel's *Gregorius Thaumaturgus* (1880).

Gregory's Powder, a drug composed of magnesia, rhubarb, and ginger, one of the safest and most efficient stomachic aperients. Its disagreeable taste is best covered by cinnamon water and a little sugar. The dose is one or two teaspoonfuls, and in mixing the water should be gradually added to the powder.

Greif, MARTIN (1839), pseudonym of FRIEDRICH HERMANN FREY, German dramatist, born at Spire. He has written a large number of historical plays—*Nero* (1877), *Marino Falieri* (1878), *Prinz Eugen* (1880), *Konradin* (1888), *Ludwig der Bayer* (1891), *Agnes Bernauer* (1893), *Hans Sachs* (1895; recast 1894), *General York* (1899), and others. Here, as well as in his *Gedichte* (1868;

new ed. 1903) and *Neue Lieder und Mären* (1902), he has taken Uhland as his model. His talent is lyric rather than dramatic; he has much metrical skill; and in some of his smaller poems he strikes a distinctly individual note, simple and natural.

Greifswald, tn., Prussia, prov. Pomerania, on the Baltic, 68 m. by rail N.W. of Stettin. It is the seat of a university (1456), with nearly 700 students. In the marketplace are several Gothic gabled houses. Its industries are machinery and railway-carriage factories, iron foundries, and fish-curing establishments. From 1631 to 1815 Greifswald was almost continuously a possession of Sweden. Pop. (1900) 22,950.

Greigia, a genus of subropical plants belonging to the order Bromeliaceæ. They have rigid, spiny leaves, and in summer bear heads of flowers, generally of a pinkish colour. They like a light peaty soil, and plenty of warmth through the winter.

Grein, MICHAEL (1825-77), German philologist, was born in Hesse-Kassel; filled the post of librarian at Kassel (1865) and Marburg (1870), and was appointed to a professorship at the latter place in 1873. A specialist in Anglo-Saxon and ancient German literature, he published *Bibliothek der angelsächsischen Poesie*, with glossary (1857-64), and part of a corresponding *Bibliothek der angelsächsischen Prosa* (1872); critical editions of the *Hildebrandslied* (1858; new ed. 1880) and *Beowulf* (1867).

Greisen, a modification of granite in which the felspar has been replaced by quartz and white mica. It is one of the characteristic rocks of tin-bearing regions, and is fairly common in Cornwall, and known also in Cumberland.

Greiz, tn., Germany, cap. of principality of Reuss (Elder Branch), lies in the valley of the White Elster, 50 m. S. of Leipzig. It has manufactures of cashmeres, merinos, and similar materials, with allied dyeing and stamping industries. Pop. (1900) 22,346.

Grenada, British isl. and colony, W. Indies, the southernmost of the Caribbees. It is 18 m. long and 7 m. broad, and contains 133 sq. m. Lofty volcanic craters surround the island, the highest being St. Catherine (2,750 ft.). The rainfall is excessive, sometimes 200 in. annually. A prominent natural feature of the island is the Grand Etang (alt. 1,800 ft.), with a circuit of 2 m. The imports in 1904 were valued at £256,269, the exports at £321,766, mostly cocoa. The island was taken from the French in 1762, and recaptured by them in 1779, but was ceded to Britain by the

treaty of Versailles (1783). It is the headquarters of the Windward government, which comprises the colonies of St. Lucia, St. Vincent, the Grenadines, and Grenada. Pop. (1901) 65,523. The capital, St. George, stands on a fine harbour in the s.w. It is an imperial coaling station.

Grenade, a hollow ball of iron filled with explosives, and burst by means of a lighted fuse. Hand-grenades, weighing 2 lbs., were thrown upon the enemy by soldiers; larger grenades were rolled from parapets upon besiegers, or fired from mortars like bombs or shells. Grenades were much used, with deadly effect, in the Japanese attacks upon the trenches of Port Arthur (1904).

Grenadier, originally a tall, strong foot-soldier trained to throw grenades. Afterwards the term was applied to the biggest men in a regiment, who were formed into a grenadier company, and wore a distinctive dress. The term is only preserved now in the style of the Grenadier Guards.

Grenadines, a chain of small islands, Windward Group, W. Indies, extending for 60 m. between St. Vincent and Grenada. Pop. (1901) 6,796—the larger part (6,500) residing on Carriacou, the chief island.

Grenelle, s.w. suburb of Paris, on l. bk. of Seine; has a celebrated artesian well (1,700 ft. deep) which forms part of the Paris water supply.

Grenfell, BERNARD PYNE (1869), English Egyptologist, born at Birmingham. Engaged since 1894 in excavation in Egypt, he has made several important discoveries of ancient papyri, including that of the *Logia*, or *Sayings of our Lord*, published in 1897 in collaboration with Mr. A. S. Hunt, with whom he has worked since 1896. Their joint publications include also *New Classical Fragments* (1897); *The Geneva Fragment of Menander* (1898); *The Oxyrhynchus Papyri* (1898-1903); *The Amherst Papyri* (1900-1); *Fayum Towns and their Papyri* (1900); *The Tebtuni Papyri* (1902); *The Hibeh Papyri* (1906). Dr. Grenfell had previously published *The Revenue Laws of Ptolemy Philadelphus* (1896), and *An Alexandrian Erotic Fragment* (1896).

Grenfell, FRANCIS WALLACE, FIRST BARON OF KILVEY (1841), British general. He served in the Kafir war (1878), and in the Zulu war (1879), distinguishing himself at the battle of Ulundi. He next took part in the Boer war of 1881. In 1882 he went to Egypt, and was present at the engagements of Tell-el-Mahuta and Kassassin (Sept. 9, 1882), and at the battle of Tell-el-Kebir

(Sept. 13). He then took part in the Nile expedition (1884-5), and in the operations of the Egyptian Frontier Field Force (1885-6), and was present at the battle at Ginniss (Dec. 30, 1885). He again served during the operations near Suakin (December 1888), and with the Nile Field Force (1889), which was under his command. He fought and won the battle of Toski (Aug. 3, 1889). He had, in the interval, succeeded Sir Evelyn Wood as Sirdar, or commander-in-chief of the Egyptian army (1885), a post he held until 1892, and during this time he re-organized and trained the Egyptian army. Grenfell commanded the forces in Egypt (1897-8), was commander-in-chief and governor of Malta (1897-1903), and is now (1906) in command of the forces in Ireland.

Grenfell, GEORGE (1849-1906), English explorer, born at Mount Bay, near Penzance, Cornwall. Sent by the Baptist Missionary Society to the Cameroons (1874), he in 1878 went to the Congo, discovered the outfall of the Mobanga R. into the Congo (1884), ascended the Congo north, and made a tracked survey of about two thousand miles of the Upper Congo. He served on the royal commission for the delimitation of the frontier between the Congo State and Portuguese territory (1891-3).

Grenoble (anc. *Gratianopolis* or *Cularo*), tn. and episc. see, first-class fortress, and cap. dep. Isère, France, on both sides of river Isère, 27 m. s.w. of Chambéry; was also cap. of the former prov. of Dauphiné. It is dominated by Mont Rachais (3,465 ft.) to the N. Being one of the most beautiful spots in France, it is a great tourist centre. It is the seat of a bishop, and has a university (500 students). The manufacture of kid gloves is the chief industry. Among other manufactures are leather-dressing, cement, paper artificial flowers, silk and linen, furniture, buttons and fasteners, hosiery, and straw hats. A large business is done in walnuts. Pop. (1901) 68,615.

Grenville, GEORGE (1712-70), English statesman; represented the borough of Buckingham from 1741 till his death. He was at first a staunch supporter of the elder Pitt; was treasurer of the navy (1756-62), First Lord of the Admiralty under Bute (1762-3), First Lord of the Treasury and Chancellor of the Exchequer (1763-5). While in office, his ministry introduced the American Stamp Act (1765). After the fall of his cabinet he became powerful in opposition, and was a thorn in the side of the Marquis of Buckingham. Though unsympathetic and nar-

row-minded, he was of the strictest integrity in public and private life. See the *Grenville Papers*, ed. W. J. Smith (4 vols. 1852-3).

Grenville, RICHARD PLANTAGENET (1797-1861). See BUCKINGHAM AND CHANDOS.

Grenville, or GREYNVILLE, SIR RICHARD (?1541-91), English seaman, belonged to Stour and Bideford, Devonshire. He commanded for his relative Raleigh the latter's second expedition to Virginia in 1585, and left there a colony under Ralph Lane, in search of whom he returned with supplies in 1586, but whom he failed to find. For the story of Grenville's death, see FLORES. See Tennyson's *Ballad of the 'Revenge'*.

Grenville, WILLIAM WYNDHAM, BARON (1759-1834), son of George Grenville. Entering Parliament for his father's old constituency of Buckingham, he was appointed secretary to his eldest brother, Earl Temple, lord-lieutenant of Ireland. He was made Speaker of the House of Commons in 1789, was Secretary of State for the Home Department (1790), and succeeded the Duke of Leeds as Secretary for Foreign Affairs (1791). He resigned office with Pitt in 1801, but in 1806 formed the ministry of 'All the Talents,' which, though it only held office for one year, passed the Act for the Abolition of the Slave Trade. In 1823 Grenville had a paralytic attack, and retired altogether from public life.

Gresham, SIR THOMAS (1519-79), English merchant and ambassador. In 1551 or 1552 he became royal agent, or king's factor, at Antwerp—a post he held down to 1574, being employed, even though a Protestant, by Queen Mary. His advice to Queen Elizabeth to restore the base money has by later economists been properly called 'Gresham's law.' Meanwhile he was also 'the greatest merchant in London,' doing business on a large scale in Lombard Street as a banker and goldsmith. He devoted his great wealth to public uses—built the Royal Exchange (1566-71) for London merchants, and also established and endowed Gresham College in London. See Burgon's *Life and Times of Sir Thomas Gresham* (1839).

Gresham's Law, the dictum that 'bad money drives out good,' first used in the proclamation of 1560 respecting the decrial of base silver coin, in which Sir Thomas Gresham took an active part in advising Queen Elizabeth. The principle is: 'Where by legal enactment a government assigns the same nominal value to two or more forms of circulatory medium whose intrinsic values differ, payments will always, as

far as possible, be made in that medium of which the cost of production is least, the more valuable medium tending to disappear from circulation.

Gresset, JEAN BAPTISTE LOUIS (1709-77), French poet, born at Amiens. Whilst a teacher in a Jesuit college at Rouen he published the poem *Vert Vert* (1734), the history of a convent parrot, told with a humour and charm unequalled in French verse. Neither *Ma Chartreuse*, a poem which followed, nor any of his subsequent works, can be compared with *Vert Vert*, although the satire of *L'Abbaye* (1741) has distinct power. Gresset also wrote some plays, the most successful of which was *Le Méchant* (1747). His *Œuvres Complètes* were edited by Renouard (1811), and *Poésies Choiesies* by Dérome (1883). See *Life*, in French, by St. Albain Berville (1863).

Greta Hall, mansion in Keswick, Cumberland, England; was the residence of Coleridge from 1800 to 1803, and of Southey from 1803 to 1843.

Gretna Green, vil., Dumfriesshire, Scotland, 1 m. N.W. of Gretna; famous, from 1771 to 1856, for the irregular marriages celebrated by the blacksmith, ferryman, or tollkeeper. In 1856 an act (19 and 20 Vict. c. 96) was passed rendering these illegal marriages invalid unless one of the parties had been resident in Scotland for twenty-one days. See P. O. Hutchinson's *Chronicles of Gretna Green* (1844).

Grétry, ANDRÉ ERNEST MONESTRE (1741-1813), Belgian musical composer, born at Liège; settled in Paris, and became a popular composer, identified with the development of comic opera. His work is characterized by graceful and original melody and knowledge of stage requirements. Some of his compositions were adopted as political party songs of the day. Works: *Le Tableau Parlant* (1769), *Barbe Bleue* (1789), *Zémire and Azor* (1771), *Richard Cœur de Lion* (1785), etc. See his *Mémoires, ou Essais sur la Musique* (1796); and *Life*, in French, by Brenet (1884).

Greuze, JEAN BAPTISTE (1725-1805), French genre painter, born at Tournus, near Mâcon; achieved success with his first picture, *The Bible-Reading* (1755). Elected to the Academy (1769), he attained to great popularity with sentimental scenes of bourgeois family life, painted with a moral purpose. His reputation to-day rests largely on his portraits and single heads, especially those of young women and girls. The simple grace and freshness of these heads, even though exaggerated in pose and sentiment,

were in striking contrast to the 'boudoir divinities' of his day. The Wallace Collection, London, possesses the largest number of his works; but he is also admirably represented in the Louvre. See Nordand's *J. B. Greuze* (1892).

Grevens Fejde, or the COUNT'S FEUD, the name given to the struggle for the Danish crown between Christian, son of King Frederick I., and Christopher of Oldenburg, backed by Lübeck, and acting ostensibly for Christian II., who had preceded Frederick as king, but had been dethroned, and was at that time held a prisoner. The struggle (1533-6) ended in the victory of Frederick's son, who ascended the throne as Christian III.

Greville, CHARLES CAVENDISH FULKE (1794-1865), English author; was from 1821 to 1860 clerk of the Council in Ordinary. He accumulated in the course of his long term of service the materials for *Memoirs*, published in three parts (1875, 1885, and 1887), which furnish important sidelights on the history of the 19th century. Greville was also the anonymous author of *Past and Present Policy of England in Ireland* (1845), a plea for the payment of the Roman Catholic clergy. See Henry Reeve's preface to the *Memoirs* (1875).

Greville, SIR FULKE, LORD BROOKE (1554-1628), English poet and statesman, was born at Beauchamp Court, Warwickshire. In 1577 he came to London with Sir Philip Sidney, and was received into high favour by Elizabeth. To this period probably belong his poems, of which the tragedy *Mustapha* (1609) alone appeared during his lifetime. Stiff and laboured in expression, their merits are of intellect rather than of feeling. Greville's affection for Sidney issued in a prose *Life* (1652), a fine piece of elaborate writing. He became Chancellor of the Exchequer in 1614, and retained his office until 1621. In 1628 he was stabbed to death by a discontented serving-man. See *Collected Works*, edited by A. B. Grosart (1870); Grosart's *The Friend of Sir Philip Sidney* (1894); *Calica*, in M. F. Crow's *Elizabethan Sonnet-Cycles* (1896).

Greville, HENRY. See DURAND.

Grevillea, a genus of Australian shrubs and trees belonging to the order Proteaceæ. They bear long racemes of small apetalous flowers arranged in pairs. The leaves of many of the species are very graceful. In Britain they are grown as greenhouse plants, and are of the easiest culture. The best known and most often cultivated is *G. robusta*, which in its native land reaches a height sometimes of

150 ft., but in Britain is generally grown as a pot plant; it has beautiful pinnate foliage.

Grévy, FRANÇOIS PAUL JULES (1807-91), French statesman and third president of the French republic, was born at Mont-sous-Vaudrey, Jura. He became an advocate in 1837, and in 1848 was elected by the republicans of his department to the Constituent Assembly. A consistent republican, he strongly opposed the second empire, but was elected a deputy in 1868 and a member of the National Assembly in 1871-3, becoming president of the same in 1873, while he was in 1876 chosen president of the Chamber of Deputies; and after MacMahon's resignation in 1879 he was elected president of the republic. He entered on a second term of office in 1885, but was compelled to resign two years later in consequence of the discovery of his son-in-law M. Wilson's dishonest traffic in decorations. He was able, thrifty, sensible, and patriotic, but somewhat narrow-minded and self-centred. See *Life*, in French, by Barhou (1879) and by Bertrand (1892).

Grewia, a genus of tropical trees and shrubs belonging to the order Tiliaceæ. They may be grown under glass in a peaty soil.

Grey, ALBERT HENRY GEORGE, FOURTH EARL GREY (1851), governor-general of Canada since 1904, succeeding his brother-in-law, the Earl of Minto. He is a son of General the Hon. Charles Grey, who was private secretary to Queen Victoria; and sat as Liberal member for S. Northumberland (1880-5), and for the Tyne-side division (1885-6). He succeeded to the title in 1894, on the death of his uncle. Earl Grey is widely known by reason of his association with S. Africa. The friend of Cecil Rhodes, he became administrator of Rhodesia (1896-97) after the Jameson raid, and in this position he showed sound judgment, tact, and business capacity, quelling the Matabele rising (1896-7) with complete success. In 1898 he was appointed a director of the British Africa Company, of which he afterwards became vice-president. He holds the position of his Majesty's Lieutenant and Custos Rotulorum of Northumberland. He is head of the trust for placing public-houses under public control, and diverting their profits to public purposes. Earl Grey has published *Hubert Hervey, a Memoir* (1899).

Grey, CHARLES, SECOND EARL GREY (1764-1845), also Viscount Howick, born at Falloden in Northumberland. In 1786 he was elected M.P. for Northumberland, and joined the opposition led by Fox and Burke, and

was one of the managers of the impeachment of Warren Hastings. When, after the excesses of the French revolution, Burke supported the government in declaring war against France, Grey stood by Fox in refusing to denounce the revolution. He joined the 'Society of the Friends of the People,' moved the impeachment of Pitt, and for a time seceded (1797) from the House of Commons by way of protest against Pitt's conduct of

nounced parliamentary reform, and had to retire from office. The story of the Reform Bill of 1832 belongs rather to the history of the United Kingdom than to the life of Grey. He retired in 1834, in consequence of a misunderstanding with some of his colleagues on the Irish Coercion Act of 1833. See *Life*, written by his son, Charles Grey (1861), his *Correspondence with William IV.* (1867), and his *Correspondence with Princess Lieven* (1899).



Sir Edward Grey, M.P.

(Photo by J. Russell & Sons.)

public affairs. In 1806 Grey became First Lord of the Admiralty, and Foreign Secretary in the ministry of 'All the Talents,' which had been formed after Pitt's death; but retired with his colleagues (1807). In 1830 Grey was called to the head of affairs in a time of great popular excitement. The Duke of Wellington most unadvisedly de-

Grey, SIR EDWARD (1862), English politician, is the grandson of Sir George Grey, who was Mr. Gladstone's colleague during many years. Entering Parliament as member for Berwick-on-Tweed (1885), which constituency he has represented ever since, he became under-secretary for Foreign Affairs, with the Earl of Rosebery as his chief (1892-5).

His grasp of foreign policy is that of a statesman, and he never speaks without making an impression on the House. Like his late chief at the Foreign Office, he is imbued with a strong imperial spirit; and with regard to the S. African war, he once declared it 'was bound to come sooner or later.' Sir Edward Grey was chairman of the commission which went out to the West Indies in 1897 to report upon the economic condition and prospects of the islands. In December 1905 he was appointed Foreign Secretary in Sir Henry Campbell-Bannerman's administration, a post for which his previous duties as under-secretary well qualified him. He is a keen angler and the author of *Fly-fishing* (1899).

Grey, SIR GEORGE (1799-1882), British statesman, son of Sir George Grey, born at Gibraltar. He entered Parliament for Devonport (1832-47), and became under-secretary for the Colonies under Lord Melbourne (1834). Successively judge-advocate-general (1839), and Chancellor of the Duchy of Lancaster (1841), he became Home Secretary under Lord John Russell in 1846. As Home Secretary he carried the Convict Discipline Bill, substituting penal servitude at home for transportation. He was also Colonial Secretary in 1854, Home Secretary under Palmerston in 1855, Chancellor of the Duchy of Lancaster (1859), and from 1861-6 Home Secretary for the third time. By no means eloquent or brilliant, he was an eminently practical minister of the old Whig school, and a sound counsellor in home affairs. See Creighton's *Memoirs of Sir George Grey* (1884).

Grey, SIR GEORGE (1812-98), British colonial governor and statesman, born at Lisbon. From 1837-40 he explored the West Australian bush for the Royal Geographical Society, the result appearing in his *Journals of Discovery* (1840). Appointed governor of South Australia (1841), four years later he went as governor to New Zealand, where he soon terminated the first Maori war. In 1854 he was sent to Cape Colony, where his policy of conciliation proved so distasteful to the Colonial Office that he was removed from office. Public opinion at the Cape, however, forced the home government to reinstate him (1859). Appointed once more as governor of New Zealand (1861), he speedily terminated the second Maori war. His sympathy with the natives, however, led to his dismissal by the home government (1867). Grey thereupon entered the New Zealand legislature (1874), and

becoming premier in 1877, advocated manhood suffrage, triennial parliaments, and other radical measures. His ministry fell in 1879, and he remained in independent opposition for fourteen years. He was author of *Polynesian Mythology* (1855); *Proverbial and Popular Sayings of the New Zealand Race* (1858). See *Rees's Life and Times of Sir George Grey* (1892).

Grey, SIR HENRY GEORGE, THIRD EARL (1802-94), British statesman, born at Howick in Northumberland; entered the House of Commons, representing Northumberland (1831), the north division of that county (1832-41), and Sunderland (1841-5) successively. He was appointed colonial under-secretary in his father's reform administration (1830-3), resigning on the West Indian slavery question. Under Melbourne (1835) he became Secretary for War, and in 1841 opposed the policy of Peel. Succeding to the earldom, he was Colonial Secretary under Russell (1846-52), and after that government's fall published a *Defence* of his colonial policy.

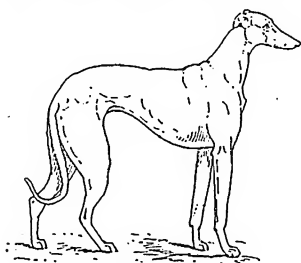
Grey, LADY JANE (1537-1554), 'the nine days' queen' of England, was born at Bradgate, Leicestershire. She was the grand-daughter of Henry VII.'s younger daughter Mary. The Duke of Northumberland compelled her to marry his fourth son, Lord Guildford Dudley, and on the death of Edward VI. had her proclaimed queen in London (July 10, 1553). Meanwhile Mary, daughter of Henry VIII., was on her way to London. Northumberland was too weak to oppose her, and the lord mayor and aldermen, obeying orders, proclaimed Mary queen (July 19, 1553). Lady Jane and her husband were beheaded in the Tower six months later.

Greyfriars, OLD, quoad sacra par., Edinburgh, Scotland. Under the same roof are the churches of Old and New Greyfriars. In the churchyard are several interesting monuments, including one to the martyred Covenanters. In 1679, after the battle of Bothwell Brig, the churchyard was used as a prison for the Covenanters. Here, too, in 1638, on a stone still preserved, was signed the Solemn League and Covenant. A drinking fountain near the entrance commemorates a faithful dog, 'Greyfriars' Bobby.'

Greyhen, the female of the blackcock or black grouse.

Greyhound. This dog probably came from the East. Its prototype is to be found in India, Persia, and Egypt at the present day. The greyhound is a thorough-bred racer, lean and 'castey' in appearance. His quarry is the hare, and the sport of greyhound

coursing has reached a high pitch of popularity. Extraordinarily high prices are given for greyhounds at the periodical sales in London of drafts from well-known kennels, and over 150 coursing meetings are held in the United Kingdom between the months of September and February. The two most celebrated greyhounds of recent years were 'Fullerton,' who four times won the Waterloo cup, a dog weighing 64 lbs.; and 'Master M'Grath,' who won it three times, and turned the scale at 54 lbs. The greyhound varies a great deal in height and weight, ranging from 23 to 27 in. and from 40 to 70 lbs. Points:—Skull rather wide between the ears and flat on the top, with powerful though not clumsy jaws, and very strong teeth; eyes dark in colour, and full of fire; ears rather small, and fine in texture; neck long and powerful (to enable it to reach the hare), yet graceful-



Greyhound.

looking; chest of fair width, and very deep; body rather long, extremely powerful, especially at the loins, and slightly arched—the back ribs being short, make the body appear tucked up; shoulders sloping; fore legs set in well under the dog, straight and powerful, with round compact feet, the knuckles of the toes being well developed; hind quarters very powerful, with muscular thighs and well-bent stifles; tail long, and carried low; colours black, red, fawn, brindled, blue, white, either whole-coloured or marked. The value of the points are: Head, 10; neck, 5; legs, 10; feet, 10; shoulders, 15; hind quarters, 20; back, 10; general symmetry, 10; tail, 5; colour and coat, 5. Coursing greyhounds are not exhibited at dog shows, where prizes are given more for appearance than for sporting qualities. See **COURSING**.

Grey League, the name of the *Ober* (Upper) *Bund*, or *Liga Griscia*, the second in date of the three leagues of Rætia, or the Grisons. Originally founded on Feb. 14, 1395, it was extended and strengthened on

March 16, 1424, at Truns. See **GRISONS**.

Greymouth, the 'Newcastle' of New Zealand, a port on the Grey R., South Island. Here are coal mines, with gold-mining and lumbering. Pop. (1901) 3,748.

Grey Powder, a drug prepared by rubbing mercury and chalk together until the metallic globules have disappeared. It is the mildest preparation of mercury, and is specially suitable for children during teething, and in derangement of the stomach. The addition of a little rhubarb is a great improvement.

Greytown. (1.) Or **SAN JUAN DEL NORTE**, chief port of Nicaragua, on the Caribbean Sea, at the N. mouth of the Rio San Juan. A mile N. of the town is the village of America, the E. terminus of the proposed Nicaragua Canal. Pop. about 2,000. (2.) Town in the centre of the Umvoti co., Natal, 65 m. S.W. of Pietermaritzburg by rail. Pop. 1,100.

Greywacke, a term which includes dark-coloured, impure, coarse-grained, arenaceous rocks, belonging to the Palæozoic formations. Typical greywackes are found in the Silurian and Cambrian formations in Britain. One very constant feature of the greywackes is the great variety of materials they contain, among which may be mentioned quartz, feldspars, muscovite, biotite, chlorite, chert, various schists, quartzite, shale and slate, graphite, iron ores, and zircon. Some greywackes are coarsely pebbly, passing into conglomerate; others are finer-grained, and approach shales. Often they have been cleaved by pressure, or may have been dragged out and partly 'granulitized' by the folding movements to which they have been subjected. Greywackes are abundant in the south of Scotland, the north of Ireland, and Wales, and in Germany, the Ardennes, Canada, and the eastern states of N. America.

Greywethers are blocks of hard siliceous sandstone, found scattered over the surface of the ground in Wiltshire and adjacent parts of the south of England. They get their names from their resemblance to sheep, and are known also as sarsen stones—perhaps from the village of Sarsden, near Andover. They are very hard and resistant to weathering, and are used for stairs, gateposts, and for building. Windsor Castle is largely built of greywethers, and at Stonehenge the outer circle is entirely composed of large blocks of this stone. They appear to be the remains of a Tertiary sand deposit which once covered the district. Many of the greywethers are from 10 to 15 ft. across.

Griboyedov, ALEXANDER SERGIEVITCH (1795-1829), Russian dramatist, born at Moscow, was secretary to the Russian embassy in Persia and in Georgia. Here, after writing a comedy, the *Young Spouses*, and other pieces, he produced a satirical drama, *Goré ot Uma* ('Overmuch Brains is Harmful') in 1821-24 (new ed. 1895; Eng. trans. 1837), a masterpiece of its kind, directed against the abuses of Russian official life. The completion of a drama of the romantic type, *A Georgian Night*, was prevented by a diplomatic mission to Teheran, where Griboyedov was killed in a riot.

Grieg, EDVARD HAGERUP (1843), Norwegian musical composer and pianist, born at Bergen, of Scottish ancestry. Early in his career he became known as a composer of outstanding merit, his fame in this direction eventually eclipsing his reputation as a pianist. To many he is best known by his compositions for the piano, but he has also written orchestral suites, cantatas, quartets, trios, sonatas for violin and for cello, besides a large number of charming songs. Grieg's music has little affinity to classical models, but belongs essentially to the modern romantic school of composition. His elegance of style, happy introduction of Scandinavian melodies, and skilful manipulation of their peculiar rhythms and quaint turns of expression are the distinctive qualities of his work. See Schjelderup's *E. Grieg og hans Værker* (1903).

Grierson, GEORGE ABRAHAM (1851), student of Indian languages, born near Dublin, went out to India (1873), and was appointed director of the Linguistic Survey of India (1898-1902). His chief publications are *Grammar and Chrestomathy of the Maithili Language*; *Seven Grammars of the Bihâri Dialects* (1883-4); *Bihar Peasant Life*, with valuable illustrations (1885); *Modern Vernacular Literature of Hindustan* (1889); *The Satsaiya of Bihâri* (1893); *Essays on Kashmiri Grammar*; and *Linguistic Survey of India* (6 vols. 1898-1904, etc.).

Grierson, SIR ROBERT (1655-1733), persecutor of the Covenanters and laird of Lag in Galloway. Born near Castle Douglas, he displayed great zeal in repressing the conventicles, and his extreme severity in enforcing the Test Act is well known. After presiding over the trial of Margaret MacLachlan and Margaret Wilson, the 'Wigtown martyrs,' he showed needless brutality on the occasion of their execution. He figures as Sir Robert Redgauntlet in Scott's *Redgauntlet*. See Fergusson's *Laird of Lag* (1886).

Griesbach, JOHANN JAKOB (1745-1812), German theologian, born at Butzbach (Hesse-Darmstadt). Appointed professor at Halle in 1773, he was afterwards transferred (1776) to Jena, and soon came to be regarded as the chief of that band of scholars to whom textual criticism of the New Testament owes its origin. His famous critical edition first appeared in 1774, marking an epoch in the history of the text. His principal works, in addition to the New Testament, are *Synopsis Evangeliorum* (1774-5); *Populäre Dogmatik* (1779); *Commentarius Criticus in Textum Græcum N.T.* (1793-1811); *Opuscula Academica* (1824-5). See *Lives* by Köthe and Augusti (1812), and Eichstädt (1815).

Griffenfeld, PEDER, COUNT (1635-99), Danish statesman, born at Copenhagen. He won the favour of Frederick III., who made him his librarian (1663); and was entrusted with the composition of the *Kongelov*, which made Denmark an absolute monarchy (1665). In the earlier years of Christian V. his influence was paramount. Created chancellor in 1673, he controlled the foreign policy of Denmark for the next three years. His aim was peace on the basis of a pan-Scandinavian league. Overthrown by a palace intrigue (1676), he was tried for high treason, and condemned to death, but ultimately was imprisoned for twenty-two years at Munkholm, near Trondhjem in Norway.



Griffin (Heraldry).

Griffin, in heraldry, a fabulous animal, with the head and forefeet of an eagle, and the body, hind legs, and tail of a lion. The head is represented with pricked ears, symbolical of its vigilance. In mythology the griffin was a creature similar in form to the griffin of heraldry, which was supposed to find its especial function in watching over hidden treasure, especially in Scythia. It was dedicated to the sun-god Apollo, whose chariot appears in early art as drawn by griffins. It was a favourite ornamental 'theme' in ancient Babylonian and Persian art, and is also

found in a similar way on art objects of the Phœnicians, the Mycenaean civilization, and the ancient Greeks. The Romans and art-workers of the renaissance used it as a purely decorative device.

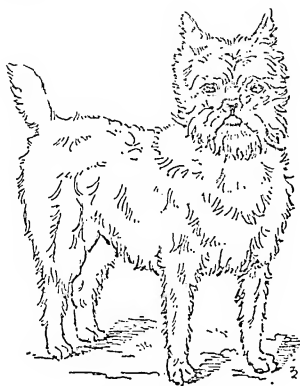
Griffin, city, Georgia, U.S.A., co. seat of Spalding co., 40 m. by rail s. of Atlanta. It has large cotton mills and a fruit trade. The State Agricultural Experiment Station is situated here. Pop. (1900) 6,837.

Griffin, GERALD (1803-40), Irish dramatist, novelist, and poet, was born at Limerick. In 1823 he settled as a journalist in London, working also at dramatic composition. Returning to Ireland, he published in 1827 *Tales of the Munster Festivals*, and in 1829 his clever anonymous novel *The Collegians*, on which, in 1830, Boucicault based his *Colleen Bawn*. In 1832 he issued a second series of *Tales of Munster*, and *The Invasion*, a historical novel. Other works are *Tales of my Neighbourhood* (1835); *The Duke of Monmouth* (1836); *Talis Qualis, or Tales of the Jury-Room* (1842). Griffin returned to Ireland in 1838, joined the Catholic Society of Christian Brothers, and died at Cork. His novels display discriminating knowledge of Irish character and keen appreciation of natural beauty. Some of his songs won wide popularity. Several of Griffin's tales are in Duffy's Popular Library (1854). His poetical works appeared in 1851, and his *Poetical and Dramatic Works* in 1857-9. His brother, William Griffin, published the *Novels and Poems*, with *Memoir* (8 vols. 1842-3).

Griffinia, a genus of Brazilian bulbous plants belonging to the order Amaryllidaceæ. They are characterized by very broad leaves and many-flowered umbels of large flowers with expanded perianths. They are not very easy of cultivation, but do best in a warm house, the bulb partly buried in a mixture of fibrous loam, leaf mould, and sand. After flowering they should have but little water. They mostly flower in May.

Griffith, SIR SAMUEL WALKER (1845), Australian lawyer, born in New South Wales, and educated at Sydney University. From 1899 to 1903 he was lieutenant-governor of Queensland, having been chief-justice from 1893. Since 1903 he has been chief-justice of Australia. Called to the Queensland bar in 1867, he was attorney-general of the colony (1874-8 and 1890-3), premier (1883-8 and 1890-3), colonial treasurer (1887-8), besides being president of the Federal Council of Australasia in 1888, 1891, and 1893. To him Queensland owes its criminal code.

Griffith's Valuation, the name popularly given to the government valuation of land in Ireland. It was derived from Sir Richard Griffith, who, about the middle of the 19th century, superintended the valuation made of all the land in Ireland. The accuracy of the valuation has been much discussed. It is still used for purposes of taxation, and indirectly for the fixing of fair rents under the Irish Land Acts.



Griffon Bruxellois.

Griffon Bruxellois, one of the newest arrivals amongst the ladies' pet dogs, and, as its name indicates, it comes from Belgium. It is a diminutive red dog, with a wiry rough coat, and weighs from three to nine pounds; very active and 'perky' in appearance, and full of play. In Belgium the ears are cropped. Points:—Head round, covered with hard bristles, a little lengthy round the eyes, on the nose, lips, and cheek; ears straight; eyes large, with moist look, round, nearly black; lashes long and black; lids often dark; eyebrows very heavy, leaving the eye to be discovered by its own brilliancy; nose always black and short, surrounded by hair meeting that round the eyes; lips black, with moustache—a little black in the latter is not a defect; chin prominent, without showing the teeth; stomach large; feet as long as possible; tail upright, docked about the second joint; colour red; hair rough, wiry, long, and plentiful.

Grig, or **GLUT** (*Anguilla latirostris*), a small eel found in the neighbourhood of the sea, and differing from the common eel in having a broad snout, in being lighter in colour, and in the position of the dorsal fin. Some authorities, however, deny that it is distinct from the common eel. The name grig is also applied to the grasshopper or cricket.

Grigoresco, NICOLAE ION (1838), Roumanian painter, born near Titu, N.W. of Bucharest, who made his fame during the Russo-Turkish war (1877-8). Born in poverty and brought up as a street arab, he began life by illuminating religious images; he then decorated the monastery of Agapia in Moldavia. He excels in pastoral subjects, in painting Roumanian types and scenery. His *Storming of Smârdan* is in the town hall at Bucharest, while in the museum in the same city there is the *Provision Transport in Bulgaria*. He has also painted a fine portrait of 'Carmen Sylva.' **Grigoriopol**, settlement in Kherson gov., S. Russia, 27 m. N.W. of Tiraspol, on the l. bk. of the Dniester. It has manufacture of fine leather. Pop. (1897) 7,600.

Grille, properly speaking, a screen or grating of unfired, pierced, or hammered metal, generally used to protect a shrine, window, or tomb. The name also applies to the grating of metal bars sometimes placed in a door for purposes of observation without opening the door; hence the word is frequently used for the screen in front of the ladies' gallery in the House of Commons.

Grillparzer, FRANZ (1791-1872), Austrian dramatist, was born at Vienna. In 1813 he entered the civil service, and in 1832 was made director of archives. In 1856 he was given a pension. His first important play was *Die Ahnfrau* (1817), a gloomy tragedy, which was put down by ignorant critics as an ordinary 'fate tragedy.' His next play, *Sappho* (1819), is a play of character, with no violent effects. It shows very great dramatic power, and won the admiration of Goethe and of Byron. Moreover, it brought Grillparzer fame, and encouraged him to still more ambitious work—a trilogy on the classical subject of *The Golden Fleecce*. This was performed in 1821, and is certainly the finest dramatic treatment of the theme. His next play, *König Ottokars Glück und Ende* (1825), is one of the best historical tragedies in the German language. After visiting Goethe at Weimar, Grillparzer produced *Ein treuer Diener seines Herrn* (1828) and *Des Meeres und der Liebe Wellen* (1831), the story of Hero and Leander, often regarded as the most exquisite tragedy of love in German literature, and *Der Traum ein Leben* (1834), a mature and brighter counterpart to *Die Ahnfrau*, fantastic and full of movement. A fresh period of his dramatic activity seemed to start with the admirable humour of *Woh dem der Mühl* (1838). It failed, and the sensitive author decided that no fresh

piece of his should be performed. But some of this work was published in 1873—the dramas *Ein Bruderzwist in Habsburg*, *Libussa*, and *Die Jüdin von Toledo*. His fragment *Esther*, and the excellent short story *Der arme Spielmann*, were published in his lifetime. As a dramatist Grillparzer is second only to Goethe and Schiller; no other, except perhaps Heinrich von Kleist, approaches him. But he is no servile follower of the classics, and stands apart from the romanticists; his work is absolutely sincere. A complete edition of his works in 16 vols., edited by M. Necker, was issued in 1903. His *Life* has been written by B. Paoli (1875), Ed. Lange (1894), M. Reich (1897), and, in French, by Ehrhard (1900). See also J. Volkelt's excellent *Grillparzer als Dichter des Tragischen* (1888), and A. Ehrhard's *F. Grillparzer* (1900). The English edition of *Sappho* (1898) by W. Rippmann contains a short biography.

Grilse. See SALMON.

Grimald, NICHOLAS (1519-62), English poet and theologian, was born of a Genoese family in Huntingdonshire. After 1543 he became a lecturer in rhetoric and classics at Christ Church, Oxford, and subsequently was chaplain to Bishop Ridley. He composed several of the neo-Latin dramas so popular with humanists and reformers. In 1552 he became a lecturer at Eccles. In 1555 his theology brought him into prison; but he recanted, and was released. Many poems by him were included in the first issue of Tottel's *Songs and Sonnets*, but nearly all were omitted from the second issue of the same year (1557). Plays: *Christus Redivivus* (1543; reprinted by M. Hart, 1899); *Archipropheta* (1548).

Grimaldi, JOSEPH (1779-1837), a clown, unequalled for artistic and physical gifts. His father was an Italian clown in London. One of the first actors to take two 'turns' a night, he literally wore himself out by rushing, in costume, night after night, from Sadler's Wells to Drury Lane. Perhaps his greatest success was in *Mother Goose*, a Covent Garden pantomime (1806). He retired in 1828. See *Grimaldi's Memoirs*, edited by Charles Dickens (1838); and *Life* by H. D. Miles (1838).

Grimm, BROTHERS—viz. JACOB LUDWIG KARL (1785-1863) and WILHELM KARL (1786-1859)—were born at Hanau. In 1806 Jacob was appointed librarian to King Jérôme at Wilhelmshöhe; in 1813 he was made secretary of legation, and then Hessian ambassador, at Paris. In 1816 he was made sub-librarian at the Kassel library—Wilhelm having

been appointed secretary at the same institution two years earlier. But they went to Göttingen in 1829, Jacob obtaining a professorship and being made librarian, his brother sub-librarian. In 1837 they were deprived of these posts for political reasons. In 1841 Frederick William IV. called them to the University of Berlin, where they remained until their respective deaths. The brothers Grimm are the leaders of the band of distinguished men who in the 19th century devoted themselves to the scientific study of the German language and literature. The most noteworthy books in which they collaborated were the epoch-making *Deutsches Wörterbuch* (as far as *Frucht*) and the *Kinder- und Hausmärchen* (1812, 1815; new Eng. trans. 1900), a collection of genuine fairy tales, with most valuable notes. Jacob wrote an excellent *Deutsche Grammatik* (1819; 2nd ed. 1822-40), *Geschichte der Deutschen Sprache* (1848), *Deutsche Rechtsaltertümer* (1828; 4th ed. 1906), *Deutsche Mythologie* (1835). Wilhelm's best-known work is *Die deutsche Heldensage* (1829). His *Kleinere Schriften* (1881-6) contain his autobiography. On Jacob see *Life*, in German, by Scherer (2nd ed. 1884) and by Berndt; two books by A. Duncker (1884) and Schönbach (1885); and C. Francke's *Die Brüder Grimm* (1899).

Grimm, FRIEDRICH MELCHIOR, BARON (1723-1807), German literary critic, and author of the *Correspondance Littéraire*, was born at Ratisbon, but spent the greater part of his life at Paris. The work by which he is remembered was undertaken in 1753, and developed into a comprehensive commentary on events political, social, as well as literary, which for insight and brilliance remains an invaluable reflection of the time. It was reissued by Tourneux (1878-82). The revolution drove Grimm to Gotha, and then to the court of Catherine II. of Russia, who appointed him her minister at Hamburg. See Sainte-Beuve's *Etudes sur Grimm* (1854), and Edmond Scherer's *Melchior Grimm* (1887).

Grimm, HERMANN (1828-1901), German author, son of Wilhelm Grimm, was born at Kassel, and in 1873 was appointed professor of the history of art at the University of Berlin. His works include *Leben Michelangelos* (1860-63; 7th ed. 1894; Eng. trans. 1865); *Essays* (earlier series, 1859; 3rd ed. 1884; Eng. trans. as *Literature*, 1886; later series, 1865; 4th ed. 1890); *Leben Raphaels* (1872; Eng. trans. 1889); *Vorlesungen über Goethe* (1877; 5th ed. 1894; Eng. trans., *Life and Times of Goethe*, 1880); and in

fiction, *Unüberwindliche Mächte* (1867) and *Novellen* (1856).

Grimma, anc. tn. in kingdom of Saxony, on the Mulde, 19 m. by rail S.E. of Leipzig; has a famous school (Fürstenschule) founded in 1550, and a 13th-century church. It carries on milling, iron-founding, etc. Pop. (1900) 10,892.

Grimmelshausen, HANS JAKOB CHRISTOFFEL VON (c. 1624-76), German novelist, was born at Gelnhausen, near Hanau, Hesse. In 1635 he was captured by the Hessians, and there is evidence of his having been a soldier at Offenburg in 1638, 1646, and 1648. He died as mayor of Renchen, in Baden, in 1676. His *Simplicius Simplicissimus* (1669) is the first German novel of real and enduring value; this and *Trutz-Simplicius* (*Landstörzerin Kurasche*), the story of an adventuress, and *Springinsfeld*, the story of a soldier of fortune (both in 1670), *Vogelnest* (1672), *Verkehrte Welt* (1673), entitle him to the first place among 17th-century prose writers in Germany. The *Simplicius Simplicissimus* is an appalling picture of the misery caused by the Thirty Years' war, of the bestial condition of the poor, and the vices and follies of the upper classes. F. Bobertag has edited it excellently, together with kindred writings of Grimmelshausen, in *Kürschners Deutsche Nationalliteratur*, vols. xxxiii.-xxxv.

Grimm's Law. This law may be described as formulating (1) the parallel changes undergone by a characteristic group of Indo-European consonants when they pass over into Teutonic speech; (2) the changes undergone by the same consonants in their transition to High German.

(1.) The Teutonic words inherited from Indo-European speech instead of the Indo-European sounds

p, t, k, b, d, g, b + h, d + h, g + h, exhibit the substitutes

ph(f), th, kh, p, t, k, bh, dh, gh.

(Regarding the symbols *bh, dh, etc.*, see PHONETICS; *k* and *g* are here the palatal back stops. There were also Indo-European velar back stops with a different history.) This law of transition exhibits also to a considerable extent the relationship between Greek and Latin on the one side and English on the other. Greek and Latin generally retain the Indo-European series; English and the Low German languages inherit the early Teutonic consonants. Greek, however, exhibits *φ, θ*, and *χ* in place of *b + h, d + h*, and *g + h*; and the Low German languages, including English, substitute *h, b, d*, and *g* for *kh, bh*,

dh, and *gh*. Examples of the parallelism between *t* and *th* are found in *tu = thou, tres = three, tenuis = thin*; of *p = f* in *pater = father* and *pisces = fish*; of *θ = d* in *θυγάτηρ = daughter*; and of *φ = b* in *φάτρης = frater = brother*. As examples of important exceptions, the case of *p, t*, and *k* after *s* may be noted (*stand = stare* without change of *t*), as well as those accounted for by Verner's law.

(2.) The change of the primitive Teutonic series into the corresponding High German consonants is too complicated to be represented in a single formula. The result varies according to the position of the consonant as initial, medial, or final, and according to the proximity of other sounds. Besides, some members of the group have been less affected than others. The process of change, which is supposed to have commenced about 600 A.D., ceased to operate before the series was completely and symmetrically transformed. The sounds most uniformly affected are *t, kh, d*, and *dh*, which become *th, d*, and *t* respectively; *th* has further been transformed into *ts* or *s* (written in German *z* and *ss*). Examples of early Teutonic *th* becoming *d* in High German are *thou = du, three = drei, thin = dünn, thorn = Dorn*; of *d* becoming *t*, *daughter = Tochter, dough = Teig*; of *t* becoming *z* or *ss*, *two = zwei, tin = Zinn, tame = zahm, water = Wasser*.

The name Grimm's Law properly applies to the formula published by Jacob Grimm in 1822:—

Greek . . . P	R F	T D TH	K G CH
Gothic . . . F	P B	TH T D	.. K G
O.H.G. (B.V) F P	D Z T	G CH K	

But the Greek, Gothic, and Old High German consonants are merely selected types, and the proposition which Grimm endeavoured to establish was that there were two successive series of 'sound-shiftings' or consonant mutations in the history of the Teutonic languages: firstly, from a stage represented by Sanskrit, Greek, and Latin to another represented by Gothic, Saxon, and Scandinavian; and secondly, from that to a third stage represented by modern standard German. The modifications now recognized to be necessary in his statement of the law have already been indicated. His formula was too symmetrical, and the second part of it in particular requires restatement. But the discovery that a law did exist was an epoch-making event in the history of philology. See Jacob Grimm's *Deutsche Grammatik*, pp. 584 ff. (2nd ed. 1822), and *Geschichte der deutschen Sprache*, vol. i., pp. 394 ff. (1848); also W. Skeat's *Principles of English*

Etymology, first series, ch. vii.-ix. (1887), and Victor Henry's *Grammaire Comparée de l'Anglais et de l'Allemand*, ch. iv. (1893).

Grimsby, GREAT, parl., munic., and co. bor. and seapt., Lincolnshire, England, at the mouth of the Humber, 35 m. N.E. of Lincoln. Among the public buildings are a fine parish church, town hall, custom house, corn exchange, free grammar school, free public library, and technical school. It is the chief fishing port in the country, with extensive foreign trade. It has eight

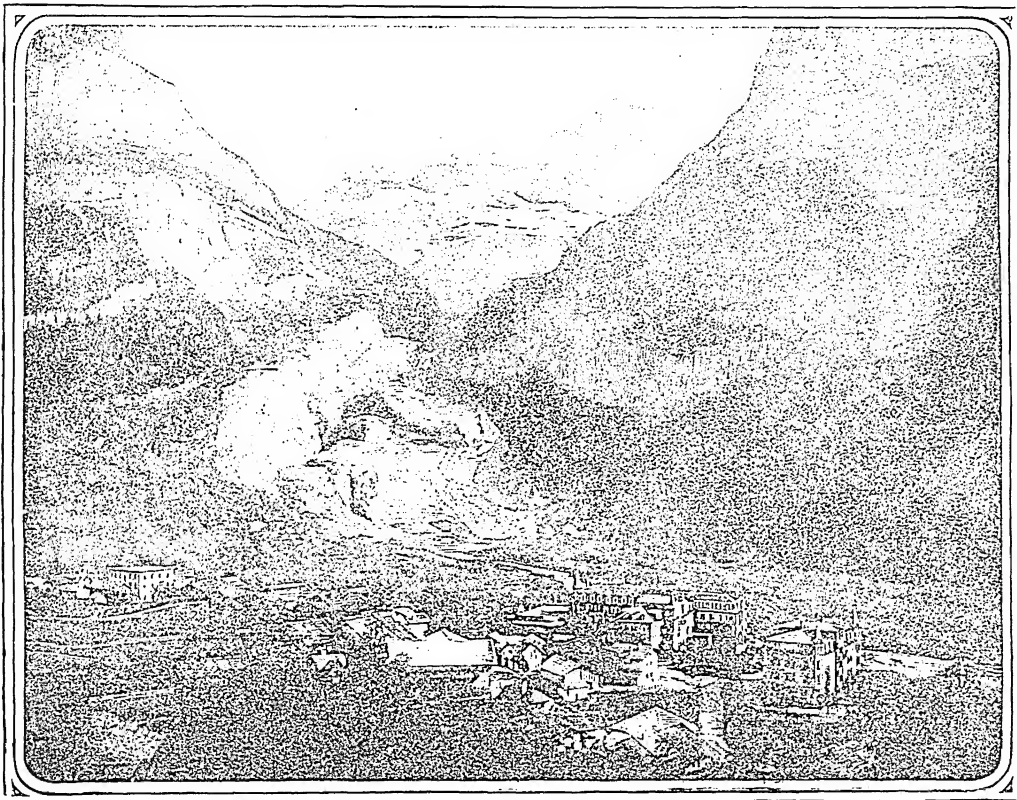
Grimsel Pass, pass, Bernese Alps, Switzerland. Its altitude is 7,100 ft., and it is now traversed by a splendid new carriage-road, which leads from Meiringen up the Aar valley over to the sources of the Rhone, at the W. foot of the Furka Pass. At the N. foot of the pass is the hospice (6,155 ft.), which in 1901 was sold to a private individual.

Grimthorpe, EDMUND BECKETT, BARON (1816-1905), eldest son of Sir Edmund Beckett Denison. He published some interesting works on architecture, and

of York in 1570, he became archbishop of Canterbury in 1575. He was suspended for nearly six years for non-compliance with the orders of Elizabeth (1577-82), but was restored again.

Grindelia, a genus of hardy American composite plants with large yellow flower-heads. They are easily grown, and may be propagated by seeds or divisions. Owing to the sticky substance which forms on the involucre, they are known as gum plants.

Grindelwald, one of the loveliest mountain-valleys of the



Grindelwald.

docks (three graving), covering 103 ac. In 1906 the Great Central Ry. began to construct at Immingham, near Grimsby, a new dock of 40 ac. The industries include brewing, shipbuilding, and ropemaking. The total value of the imports in 1905 was £10,687,421, and of the exports £11,457,137; and of the exports including shell-fish, landed in 1904, £2,518,639. Great Grimsby returns one member to Parliament. Pop. (1901) 63,138. Cleethorpes, a suburb, 3½ m. S.E., is a popular seaside holiday resort.

was an authority on clocks and bells. He designed, in conjunction with Airy, the astronomer-royal, Big Ben, the clock of Parliament, and restored at his own expense the cathedral of St. Albans (from 1877), a work which has been very adversely criticised.

Grindal, EDMUND (?1519-83), archbishop of Canterbury, born at St. Bees in Cumberland. Ridley, bishop of Rochester, employed him in religious disputations. In 1559 he became bishop of London. Elected to the see

Bernese Oberland, Swiss canton of Bern, much frequented both in summer and in winter. It contains (1900) 3,346 inhabitants, practically all German-speaking and Protestants.

Grinding. See KNIVES.

Gringore, PIERRE, called GRINGOIRE by Victor Hugo (c. 1470-1539), French satiric poet and dramatist, born at Caen in Normandy; published *Chateau de Labour* (1499) and *Chateau d'Amours*, and became 'Mère Sotte' of the theatrical company known as 'Enfants sans

Souci,' and attacked Pope Julius II. in *La Chasse du Cerf des Cerfs*. His best-known works are *Le Jeu du Prince des Sots et de la Mère Sotte*, a play (1511); *Le Mystère de Saint Louis* (c. 1528); and *Les Heures de Notre Dame*. He was an active opponent of Protestantism. His *Oeuvres* were published in 1858-77. See Badel's *Pierre Gringoire* (1893). Mr. Beerbohm Tree has impersonated him in a most impressive little sketch.

Grinnell Land. (1.) The N.W. extremity of N. Devon, in the Arctic regions of N. America; discovered in 1850 by De Haven, in the first Grinnell expedition, when searching for Franklin. (2.) Large barren tract in the N. Polar basin, to the N.W. of Greenland, from which it is separated by Kennedy Channel; discovered by Hayes in the second Grinnell expedition. From Sverdrup's investigations, it appears to form one continuous land mass, with Grant Land to the N. of it, and Arthur Land, Ellesmere Land, King Oscar Land, and N. Lincoln to the S. of it.

Grinstead. (1.) EAST, mkt. tn., Sussex, England, 30 m. S.E. of London. Its Sackville College was founded in 1609 as an almshouse. Brewing, brick and tile making, are carried on. Pop. (1901) 6,094. (2.) WEST, par. and vil., W. Sussex, England, 7 m. S. of Horsham. It was here that the incident suggesting Pope's *Rape of the Lock* took place. Pop. (1901) 1,503.

Gripenberg, OSCAR CASIMIROVITCH (1838), Russian general, gained distinction in the Crimea, and by his services at the time of the Polish insurrection (1863) and in the Turkestan campaigns of 1867-8. In the Russo-Turkish war (1877-8) he commanded the Moscow regiment of guards, and in the Russo-Japanese war (1904-5) the second Manchurian army.

Gripes, or GRIPING, the popular term for the attacks of pain which accompany various colics. Gripes are treated with hot external applications, such as fomentations and poultices, and in severe cases by various preparations of opium.

Griqualand. (1.) EAST, native district in E. of Cape Colony, with a pop. (1904) of 222,459, of which only 5,868 were of European extraction. The district lies between the Drakensberg, Natal, Pondoland, and Tembuland, and has an area of 7,600 sq. m. The chief town and seat of magistracy is Kokstad. (2.) WEST, district formerly belonging to the Griquas, and famed for its diamond mines. The British flag was hoisted here in 1871. The province of Griqualand West forms part of Cape Colony, and

has a total population of 83,375. Area, 15,200 sq. m.

Grisebach, AUGUST HEINRICH RUDOLF (1814-79), German botanist, a native of Hanover. In 1841 he was appointed professor at Göttingen, and in 1875 made director of the botanical gardens there. He was especially distinguished for his work on the geographical distribution of plants, in *Die Vegetation der Erde nach ihrer klimatischen Anordnung* (1872; new ed. 1885). Grisebach was the author also of *Genera et Species Gentianacearum* (1839), *Grundriss der systematischen Botanik* (1854), *Erläuterungen ausgewählter Pflanzen des tropischen Amerika* (1860), *Flora of the British West Indian Islands* (1859-64), *Catalogus Plantarum Cubensium* (1866), and *Plantae Lorentzianae* (1874).

Griseida, or GRISELDIS, the heroine of the well-known mediæval tale, is the model of patient submission and conjugal obedience. Her husband put her love and obedience to three terrible trials, but she emerged triumphant from them all. The story appears in Boccaccio's *Decameron*, and Chaucer celebrates the 'Patient Griseldis' in the *Clerkes Tale*.

Griselinia, a genus of trees and shrubs belonging to the order Cornaceæ. They bear thick, leathery leaves and panicles of small flowers. They are half hardy in England.

Grisi, GUILIA (1811-69), Italian operatic singer, born at Milan; made her début (1828) at Bologna as Emma in Rossini's *Zelmira*. Her appearances in Paris (1832-49) and in London (1834-61) won for her a world-wide reputation. She also paid a visit to the United States in 1854. She sang at concerts in London from 1866-69, but it was on the operatic stage, and especially in the part of Norma, that her great success was won.

Grisson, or HURON (*Galictis vittata*), a small weasel found in S. America, and extending northwards to Mexico. From its ally the tayra (*G. barbara*) it differs in the relatively shorter tail, and in the smaller size.

Grisons (Ger. *Graubünden*), one of the Swiss cantons, admitted into the confederation as late as 1803. It is chiefly composed of the mountain-valleys wherein are the three chief sources of the Rhine, together with the upper valley of the Inn (or Engadine). It comprises most of Upper Rhetia, and till 1798 consisted of three allied leagues—viz. the Grey League (founded 1395), the League of God's House (1367), and the League (1424) of the Ten Jurisdictions (founded 1436). In area it is the largest of the Swiss cantons (2,773 sq. m.).

In 1900 the population was only 104,520, of whom 55,371 were Protestants, and 49,585 Roman Catholics, while 48,937 were German-speaking, 17,883 Italian-speaking, and 36,508 spoke Rumansch or Ladin. The capital of the canton is Coire, and other well-known places are Davos, St. Moritz, Pontresina, and Arosa.

Griswold, RUFUS WILMOT (1815-57), American editor and writer, was born at Benson in Vermont, and engaged in printing and journalism in Philadelphia, Boston, and New York, being editor of the *International Magazine*, afterwards incorporated with *Harper's Magazine*. His compilations were popular, among them being *Poets and Poetry of America* (1842), *Poets and Poetry of England in the 19th Century* (1845), *Female Poets of America* (1848), *Prose Writers of America* (1846), *The Republican Court, or American Society in the Days of Washington* (1855). He wrote a *Life of Edgar Allan Poe*, prefixed to his edition of Poe's *Works* (3 vols. 1850), which called forth much adverse comment. See his *Correspondence*, ed. W. M. Griswold (1898).

Grit, a coarse-grained arenaceous rock, intermediate between sandstone and conglomerate. Very impure dark-coloured grits belonging to the older formations are often known as greywackes. The fragments contained in grits are mostly quartz and felspar, though chert, slate, igneous rocks, calcareous debris, iron ores, and epidote are frequent. The cementing material is usually siliceous, but some grits have a calcareous matrix. Well-known British grits are those of the Torridonian of Scotland and Wales, the Pennant grit and Kinder Scout grit of the English Carboniferous. The millstone grit is an important subdivision of the Carboniferous system. As a rule, grits are not fossiliferous. They are used for building and engineering purposes.

Grivegnée, tn., prov. Liège, Belgium, 3 m. S.E. of Liège; has iron works and engineering shops. Pop. (1901) 9,856.

Groat, the name given in mediæval times to all thick coins, to distinguish them from those which were only stamped on one side. The silver groat, originally issued in the 14th century, was worth fourpence of our money.

Gröber, MAX GUSTAV (1844), German Romance philologist, was born at Leipzig. He became successively lecturer in philology at Zürich (1871), professor at Breslau (1874), and in 1880 at Strassburg. He has published studies on mediæval MSS. (*Petrarchas* in 1869, and troubadour poems in 1876), and has

written on old French romances and *pastourelles* (1872), mediæval Latin student songs (new ed. 1890), vulgar Latin *substrata* of Romance words, etc. He possesses, moreover, a remarkable talent for organization. Since 1877 he has edited the *Zeitschrift für romanische Philologie*, which holds its own with *Romania* as an organ for the advancement of Romance philology; while the *Grundriss der romanischen Philologie* (1885-1902), issued under his supervision, is indispensable to the student.

Grobya, a genus of epiphytal orchids, natives of Brazil. They bear grasslike leaves and short racemes of yellow flowers.

Grocyn, WILLIAM (c. 1446-1519), English Greek scholar, born at Colerne, Wiltshire. Grocyn was the first to teach Greek publicly in the University of Oxford, and there Erasmus heard him. He was presented (1481) to the living of Newton Longueville, near Bletchley, and became prebendary of Lincoln (1485). He resigned the benefice of Deepdene in Surrey (1493) for the rectory of St. Lawrence Jewry, London, which he held until 1517. A catalogue of his books was printed for the Oxford Historical Society by Professor Burrows (1890).

Grodek, tn., Austrian prov. of Galicia, 25 m. by rail s.w. of Lemberg. Pop. (1900) 11,845.

Grodno. (1.) Government of W. Russia, is bounded on the w. by Poland. Area, 14,961 sq. m. Its surface is flat, and forests (pine chiefly) and swamps cover a considerable portion. Bees are kept in abundance. The principal rivers are the Nyeman, which is navigable from a little above Grodno city, and the W. Bug. Pop. (1897) 1,617,859. Chief town, Grodno. (2.) Or HORODNA, tn., W. Russia, cap. of above gov., on the r. bk. of the Nyeman, 75 m. s.w. of Vilna. The city contains an ancient palace of the Polish kings (12th and 13th centuries), a more modern palace built by Augustus III. (now converted into a military hospital), the Greek house of St. Basil, the former Jesuit College, and the Carmelite monastery. The academy of medical science was founded by King Stanislaus Augustus. It manufactures tobacco, soap, candles, vinegar, bricks, machinery, carriages, and has breweries, distilleries, sawmills, iron foundries. The city has been almost wholly rebuilt since the great fire of June 10-12, 1885. Pop. (1897) 46,871. From 1673 it was a place of meeting of the Polish and Lithuanian diets.

Groen van Prinsterer, WILLEM (1801-76). Dutch politician and historian, born near the

Hague; from 1829-33 was secretary to William I. of Holland; but subsequently sat (1848-65) in the second chamber, and became the leader of the 'anti-revolutionary' party. His chief original works are *Handbook of Dutch History* (1841-6; new ed. 1874) in Dutch, and *Maurice et Barnevelt* (1875) in French. He is best known as editor of the *Archives, ou Correspondance inédite de la Maison d'Orange-Nassau* (15 vols. 1835-64). See *Biographies*, in French, by Stuart (1876), and, in Dutch, by Vos (1886-91).

Grog, properly rum and water, but also a colloquial name for any similar drink. On Aug. 4, 1740, Admiral E. Vernon (1684-1757), nicknamed 'Old Grog,' from his program boat-cloak, prohibited the serving out of 'neat' rum to his sailors. The tars transferred the nickname from the man to the diluted mixture.

Grolier, JEAN (1479-1565), French book-collector, born at Lyons. He was sent as ambassador to Milan and Rome, and on his return to France was made treasurer (1537). The foundation of his famous library, which afterwards grew to 3,000 volumes, was laid in Italy. About sixty of these, whose value ranges from £25 to £100 each, are in the National Library of Paris. See *Recherches sur Jean Grolier*, by Le Roux de Lincy (1866).

Gronau, tn., Prussian prov. of Westphalia, 60 m. by rail N.W. of Dortmund, with cotton factories and dye works. Pop. (1900) 8,170.

Groningen. (1.) Province of Netherlands, in the extreme N.E. Cattle, horses, butter, and a few manufactures are the chief products. Area, 790 sq. m. Pop. (1899) 299,602. (2.) Principal tn. in the N. of the Netherlands, and chief tn. of the above prov., stands 20 m. s.w. of the Dollart; is the seat of a university, founded in 1614, and attended by about 400 students. It possesses several 17th-century and other old houses, and is famous for its corn and oil-seed markets. It was taken from the Spaniards by the Dutch, after a stubborn defence, in 1594. Pop. (1899) 66,537.

Gronovius (the Latinized form of GRONOV), the name of a learned family of German origin, which settled in Holland. The chief were:—JOHANNES FRIDERICUS (1611-71), antiquarian and classical scholar, born at Hamburg; became professor at Deventer (1642), and later at Leyden (1659). He is best known by his editions of the classics.—JACOBUS (1645-1716), son of the preceding, born at Deventer. His chief work is *Thesaurus Antiquitatum Græcarum*, in 13 fol. vols. (1697-1702).—ABRAHAM (1694-1775), son of

Jacobus, practised as a physician both in England and Holland. He was librarian of Leyden University.—JOHANNES FRIDERICUS, the younger (d. 1760), brother of Abraham, was a naturalist, and particularly a botanist. He corresponded with Linnaeus.—LAURENTIUS THEODORUS (d. 1777), brother of the preceding, and, like him, an ardent naturalist. He wrote a great work on fishes, the *Museum Ichthyologicum* (1754-6).

Groome, FRANCIS HINDES (1851-1902), son of Archdeacon Groome of Suffolk, was born at his father's rectory of Monk Soham. He devoted himself (1877) to literary work, and is especially known for his researches into the language, lore, history, and characteristics of the gypsies, the introduction to his *Gypsy Folk-Tales* (1899) being a marvel of recondite learning. He also wrote *In Gypsy Tents* (1880), and edited Borrow's *Lavengro* (1901); and he was one of the founders of the Gypsy Lore Society, and joint-editor of its *Journal* (1888-91). His other publications include *A Short Border History* (1887); *Two Suffolk Friends* (1895)—i.e. Archdeacon Groome and Edward Fitzgerald; and *Kriegspiel*, a novel (1896). He edited the *Ordinance Gazetteer of Scotland* (1884-5; new eds. 1893-5 and 1901), was one of the editors of *Chambers's Encyclopedia* (ed. 1885-92), and joint-editor of *Chambers's Biographical Dictionary* (1897).

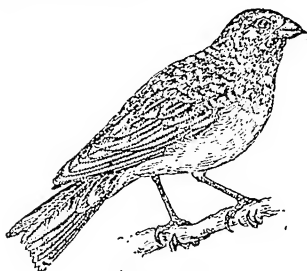
Groot, GERHARD (1340-84), founder of the 'Brethren of the Common Life,' was a native of Deventer. Becoming a missionary preacher in 1379, he devoted his energies to the community of 'Brethren of the Common Life,' which included both clerical and lay members, who supported themselves by their own industry, while following the rule of St. Augustine. A corresponding sisterhood was also founded, and the order spread throughout the Netherlands, until its extinction at the reformation. See Ullmann's *Reformers before the Reformation* (Eng. trans. 1855), and *Vita Gerhardi Magni*, by Thomas à Kempis, the first authority.

Groote Eylandt, isl. on the w. shores of the Gulf of Carpentaria, in the N. Territory of S. Australia, 40 m. long by 40 m. broad.

Gros, ANTOINE JEAN, BARON (1771-1835), French painter, born in Paris; entered David's studio (1783). Bonaparte attached him to his headquarters as military painter (1796). He broke away from the classical traditions of David, and gained his brilliant reputation as historical painter of Napoleon's career. His best work includes *The Battle of Nazareth, 1802* (Nantes); *Les Pestiférés de Jaffa* and *The Battle*

of Eylau, 1808 (Louvre); *General Bonaparte Reviewing the Troops* (Wallace Collection, London). Being a man of profoundly naturalistic tendencies, he was bitterly opposed to romanticism; and so conscious was he of the failure of his *Hercules et Diomède* (1833) that he drowned himself in the Seine at Meudon. See J. Tripiet de Franc's *Histoire.... du Baron Gros* (1878).

Grosart, ALEXANDER BALLOCH (1827-99), British divine and scholar, born at Stirling. He was United Presbyterian minister of Kinross (1856-65), then of Princes Park, Liverpool (1865-8), and finally of St. George's, Blackburn (1868), from which he retired in 1892. His most important work was as editor of Elizabethan and Jacobean writers, contained in the *Fuller Worthies Library* (39 vols. 1868-76) and the *Chertsey Worthies Library* (14 vols. 1876-81), among which are Cowley, Vaughan, Quarles, Breton, Sylvester, Beaumont, and Henry More; the *Huth Library* (40 vols.), containing Greene, Nash, Dekker, Harvey; while among *Miscellaneous Issues* (1886) he included Spenser, Daniel, Drayton, Sidney, Giles and Phineas Fletcher, Donne, Crashaw, Wither, etc. See article in *Westminster Review*, June 1899, by Oliphant Smeaton.



Grosbeak.

Grosbeak. The scarlet grosbeak (*Pyrrhula erythrina*) is a small passerine bird nearly related to the bullfinch, common in N. Europe, and occasionally straying into Britain. The males are remarkable for their bright plumage, whence the name of rosy finch sometimes given to them. An allied bird is the pine grosbeak (*P. cnuclator*), found in the northern regions of both hemispheres.

Grose, FRANCIS (?1731-91), English antiquary, born at Greenford, Middlesex. He exhibited at the Royal Academy; also became Richmond herald (1755-63). From 1773-87 appeared his *Antiquities of England and Wales*, illustrated by his own drawings. In 1789, while preparing his *Antiquities of Scotland* (1789-91), he met Robert Burns. Grose also published

The Antiquarian Repertory (1775), a *Classical Dictionary of the Vulgar Tongue* (1785; reissued in 1811 as *Lexicon Balatronicum*), and other works.

Gross, SAMUEL DAVID (1805-84), American surgeon, born near Easton, Pennsylvania; was appointed professor of pathological anatomy at Cincinnati (1835). He filled the chair of surgery at Louisville (1840) and New York universities (1850), and at Jefferson College (1856-84). He published *Gross's System of Surgery* (1859; new ed. 1884), *Diseases of the Bones and Joints* (1830).

Grossbeeren, vil., Prussia, 12 m. S. of Berlin. It was the scene of the defeat of the French, under Oudinot, by the Prussians, under Von Bülow, on Aug. 23, 1813.

Grossenhain, tn., kingdom of Saxony, 24 m. by rail N.W. of Dresden; the seat of large cloth, hosiery, machinery, and wax-cloth factories; breweries, saw-mills, brickworks, and tanneries. Market-gardening is an important industry. Pop. (1900) 12,064.

Grosseteste, ROBERT (?1175-1253), bishop of Lincoln, historian and writer, born in Suffolk; became rector of the Franciscans in Oxford (1224). He was learned in Aristotle, and a skilful preacher. On the death of Hugh de Wells he was elected bishop of Lincoln (1235). In 1250 he was embroiled in differences with the Pope, championing the secular clergy against the encroachments of monasteries on parish endowments, but failed to get satisfaction. He not only wrote on theology and history, but also composed commentaries on Aristotle, poems in French, works on husbandry, and translations from Greek authors. See H. R. Luard's edition of Grosseteste's *Letters* (Latin; 1862), Pegge's *Life of Grosseteste* (1793), and Stevenson's *Life of Grosseteste* (1899).

Grosseto. (1.) Province, Tuscany, Italy, is washed by the Tyrrhenian Sea on the W. It embraces a large part of the Maremma, but rises in the E. to 5,470 ft. in Monte Amiata. It produces quicksilver, Siena earthenware, and timber. Area, 1,738 sq. m. Pop. (1901) 144,722. (2.) Town and episc. see, cap. of above, 90 m. S.E. of Pisa. Its cathedral dates from 1294. Pop. (1901) 8,843.

Grossglockner. See GLOCKNER, GROSS.

Gross-Jedlersdorf. See JEDLERSDORF.

Gross-Lichterfelde, comm. in prov. Brandenburg, Prussia, lies 6 m. S.W. of Berlin, and forms a suburb of the capital. Here is the royal Prussian cadet institute. Pop. (1900) 23,168.

Gross-Meseritsch, tn., Moravia, Austria, 20 m. E. of Iglaun; has manufactures of linen and leather, and trade in fruit. Pop. (1900) 5,236.

Grossmith, GEORGE (1847), English actor and entertainer, in 1870 made his début as an entertainer, entering in 1877 upon his successful career as an actor in the Gilbert and Sullivan operas. In 1889 he undertook the first of the tours, extending through Britain and America, by means of which his humorous recitals have become so widely known. He is the composer of *Haste to the Wedding* and *Uncle Samuel*, besides numerous songs and musical sketches, and is the author of *A Society Clown* (1888). *The Diary of a Nobody* (1892) was produced in collaboration with his brother, Weedon Grossmith.

Grossmith, WEEDON, English actor and artist, brother of the preceding, has acted with Sir Henry Irving, and from 1894-6 was lessee and manager of the Vaudeville Theatre. He published *A Woman with a History* (1896); with George Grossmith, *The Diary of a Nobody* (1892); and is the author of plays, including *A Commission*, *The Night of the Party* (1901), and *The Duffer* (1905).

Grossulariaceæ, a natural order of shrubby plants, of which the gooseberry and the currant are the principal representatives. The order is characterized by the axillary clusters of flowers, followed by pulpy berries.

Grossularite, a calcium aluminium garnet, pale green or olive green in colour, found in the Alps, Siberia, Norway, Silesia, and elsewhere. See CINNAMON-STONE.

Grosswardein (Hung. *Nagyvarad*), anc. tn. and episc. see of Hungary, co. Bihar, on the Rapid Körös, 153 m. by rail S.E. of Budapest. It possesses two cathedrals—one belonging to the Roman Catholics, the other to the Greek Catholics; also an episcopal palace (Roman Catholic), a law academy, and portions of a former citadel. Milling, distilling, brickmaking, etc., are carried on, and good wine is grown. The city was destroyed by the Mongols in 1241, and from 1663 to 1692 it was in the power of the Turks. Pop. (1900) 47,018.

Grosvenor Family. See WESTMINSTER.

Grote, GEORGE (1794-1871), English politician and historian, born at Clay Hill, near Beckenham, Kent; at sixteen entered his father's counting-house (a bank). He devoted his leisure to literature, and in 1846 published the first volume of *The History of Greece* (finished in 1856), which was universally received as the work of a first-rate historian. This was followed by *Plato and*

other *Companions of Socrates* (1865), proving his mastery over the thought as well as the deeds of Greece. His last years were devoted to advocating the interests of University College, London, advancing the cause of the University of London, and preparing his *Aristotle* (1872). He was buried in Westminster Abbey, in Poets' Corner, near Macaulay. See *Personal Life of G. Grote* (1873), by his widow; and his *Minor Works* (ed. A. Bain, 1873).

Grottefend, GEORGE FRIEDRICH (1775-1853), German scholar, born at Minden, Hanover. From 1821 to 1849 he was director of the lyceum at Hanover, and published works on the ancient Umbrian and Oscan dialects, on Latin grammar, on German prosody, and on the history and geography of ancient Italy. He is chiefly famous for deciphering with great patience and extraordinary ingenuity the ancient cuneiform writing of Babylonia. His *Neue Beiträge zur Erläuterung der Persepolitischen Keilschrift* was published at Hanover in 1837, and his *Neue Beiträge zur Erläuterung der Babylonischen Keilschrift* in 1840.

Grottefend, KARL LUDWIG (1807-74), German classical scholar, son of the preceding, born at Frankfurt. His most important book deals with the coinage of ancient Bactria (*Die Münzen der . . . Könige von Baktrien*, 1839). He wrote other works on coins, and on various historical subjects—e.g. *Imperium Romanum tributum Descriptum* (1863).

Grotesque, a style of capricious ornament distinguished by the intermingling of figures, animals, flowers, fruits, etc.; from arabesque, which is confined to plant forms. This style was generally favoured during the renaissance, but soon became debased. The term is also applied to extravagant, whimsical, or absurd representations of the human figure. See **CARICATURE**.

Groth, KLAUS (1819-99), German poet, was a native of Heide, Holstein. He became lecturer on German language and literature at Kiel University in 1858, and was appointed professor of German language and literature there in 1866. His fame rests chiefly on the collection of poems entitled *Quickborn* (1852; 25th ed. 1900), which are written in *Plattdeutsch*, and describe with exquisite charm Dithmarsh life and ways. He also wrote a number of tales in the same dialect: *Vertellen* (1855-9), *Voer de Goern* (1855), *Ul min Jungsparadies* (1875). The poems in *Hundert Blätter* (1854) are in literary German. His genial *Lebenserinnerungen* were edited by Eug.

Wolff in 1891; his *Collected Works* were issued in four volumes in 1893; and the story of his life has been told by Ad. Bartels (1899).

Grotius, HUGO, or HUG VAN GROOR (1583-1645), Dutch jurist, born at Delft. In 1615 he was sent to England to arrange the difficulties arising from the whale fisheries of Greenland. On May 18, 1619, Grotius was condemned to perpetual imprisonment, and his property confiscated, in consequence of his political and religious opinions; but after eighteen months' confinement he escaped by the ingenuity of his wife, and found shelter in Paris. He wrote during his imprisonment his treatise on the *Truth of the Christian Religion*, in Dutch verse (which he translated into Latin prose in 1627), and also wrote the *Inleydinghe tot de Hollandsche Rechtsgelcerdheyd* (1639). Among his works on jurisprudence, *De Jure Belli et Pacis* (1625; English trans. by Whewell, 1853) is the most famous; and in history the *Annales et Historie de Rebus Belgicis* (1657). Grotius was intellectually one of the greatest men of his age, while as a scholar he stood in the very first rank for variety and breadth of culture. See *Grotius* (trans. by D. P. de Bruyn, 1894), and *Life* by Buller (1827).

Groton, tn., New London co., Connecticut, U.S.A., on the river Thames. Arnold took (1781) Fort Griswold, and massacred the garrison. Pop. (1900) 5,962.

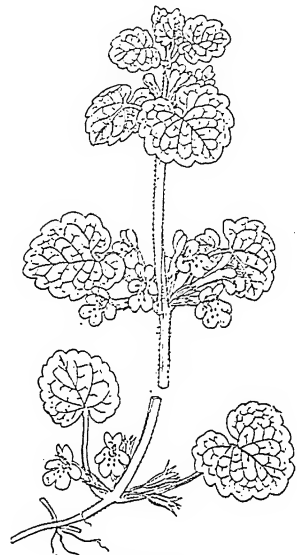
Grottaglie, tn., prov. Lecce, Italy, 32 m. by rail s.w. of Brindisi. It produces pottery. Pop. (1901) 11,305.

Grotte, tn., prov. Girgenti, Sicily, 13 m. N.E. of city of Girgenti; has sulphur mining industry. Pop. (1901) 11,055.

Grouchy, EMMANUEL MARQUIS DE (1766-1847), French general, born at Paris. He fought in Savoy, La Vendée, and under Moreau in Piedmont; was nominated commander-in-chief of the army of Italy, but was wounded and taken prisoner at Novi. Later he distinguished himself at Hohenlinden, Eylau, Friedland, Wagram, and in the Russian campaign of 1812. He was one of the first to join Napoleon on his return from Elba, was created a marshal of France, and defeated Blücher at Ligny. Though within sound of the guns of Waterloo, he failed to come to his chief's assistance in time. After Waterloo he retired to the United States, but returned to France in 1819. See his *Mémoires* (1873-5).

Ground-annual, in Scots law, an annual duty payable out of land, and made a real burden upon it. It is reserved instead of a feu-duty in cases where sub-

infeudation is prohibited, and it is also the name given to the perpetual feu-duty payable out of church lands to the successors of the lords of erection.



Ground Ivy.

Ground Ivy (*Nepeta glechoma*), a common British labiate hedge-row plant, with trailing stems, kidney-shaped, crinkled, aromatic leaves, and axillary, purplish flowers in early summer.

Groundling (*Cobitis taenia*), a small and rare British freshwater fish. It is one of the loaches.

Ground-nut, a common name for edible portions of various plants—e.g. the pods of the ground pea-nut (*Arachis hypogaea*), the tuberous roots of the earth-nut (*Bunium esculentum*), the roots of *Apios tuberosa*, the roots of the dwarf ginseng (*Aralia trifolia*), etc. See **EARTH-NUT**.

Ground-pigeon, a name given to the *Peristerinae*, a sub-family distinguished from other pigeons by the relatively greater length of the legs, which are equal to or longer than the middle toe. To this sub-family belong the turtle-doves. See **PIGEON**.

Ground-rent, the rent paid to the owner of land in England granted upon building leases. A building agreement is first entered into, which among other things fixes the total amount of the ground-rent to be reserved, and the apportionment of it among the houses to be erected. The builder then begins to build houses, and, as they are completed, the landlord grants leases of them, reserving the appor-

tioned part of the total ground-rent by each lease. In this way the purchaser of each lease is only liable for his own breaches of covenant, whereas if one lease of the whole building estate were granted, each tenant would be liable for the breaches of all the others.

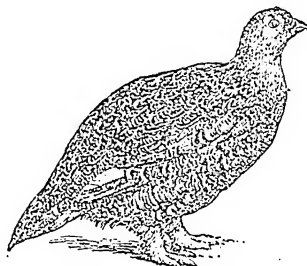
Groundsel (*Senecio vulgaris*), a common annual weed belonging to the order Compositæ. It has yellow flowers and dentate leaves. There is a larger species, common in gravel soil, called the mountain groundsel (*S. sylvaticus*).

Groups, THEORY OF, a modern branch of mathematics in which operations, and not quantities, are the immediate subject of discussion. The set or series of operations which make up a group must be so related amongst themselves that the successive application of any two will be equivalent to another of the group, or to the 'identical' operation. Thus the rotations through a right angle about three perpendicular axes meeting at a point form with their inverses a group; for if ijk represent these rotations about the axes xyz (see CO-ORDINATES), then $ij = k$, $jk = i$, $ki = j$, $ii^{-1} = 1$, etc. This combination of an operator and its inverse is the identical operation, leaving the subject of it unchanged. Many groups contain an infinity of members—such, for example, as all rotations of a plane figure round a fixed axis perpendicular to its plane; for the result of any two rotations is equivalent to a third. Now the quantity $x_1y_2 - y_1x_2$, where x_1y_1 and x_2y_2 are the co-ordinates of two given points, never changes value whatever rotation may be given to the figure; it measures twice the area of the triangle formed by joining the two points and the centre of rotation. Such a quantity, which is unchanged by the application of any member of the group, is said to belong to the group or to be an invariant of the group. The operations of a group may be finite only, as in the case first mentioned, and the group is then said to be 'discontinuous.' In a continuous group transition may be made from member to member of the group by infinitesimal changes. Such, for example, is the group which includes all rotations about a fixed axis. The whole of the mathematical theory of crystallography is built upon the properties of certain discontinuous groups, for an account of which see Hilton's *Mathematical Crystallography* (1903). See also the writings of Klein, Lie, Burnside, etc.

Grouse, a term strictly applicable to all the members of the sub-family Tetraoninae, but usually employed in a much more

restricted sense. Three species of grouse occur in Britain—the black grouse (see BLACKCOCK), the wood-grouse (see CAPERCAILLIE), and the red grouse (*Lagopus scoticus*), the bird to which the term is usually restricted in ordinary speech. The red grouse is remarkable in that it is peculiar to the British area, but it is usually considered to be only a local form of the willow grouse (*L. albus*) of Northern Europe, Asia, and America. From this bird and its other near allies it differs in not becoming white in winter. According to Mr. Ogilvie Grant, three varieties of plumage occur in the male. To the same genus as the red grouse belongs the ptarmigan.

GROUSE-SHOOTING, in the accepted sense of the phrase, refers to the red grouse (*Lagopus scoticus*), sometimes called the moorcock or moor-fowl. It is found in the northern counties of England, especially Yorkshire, Lancashire, Derbyshire, and Durham;



Red Grouse.

in the mountains of Wales and in Ireland; but it is most plentiful in the Highlands of Scotland. It lives in the heather, the young shoots of which, and those of the wild ling, form its chief food at certain seasons. The grouse is monogamous, pairs early in the spring, lays from five to fifteen eggs, which take twenty-four days to hatch. For the first fortnight the young chicks are very delicate, but after that rapidly acquire strength and independence. But they are liable to an epidemic disease known as *Strongylus pergracilis*, which carries off young and adult birds alike, and in some fatal seasons practically closes the moors. The young birds remain with their parents until the autumn, when they 'break up,' to collect at the beginning of winter in 'packs,' sometimes of fifty or sixty. At this period they are extremely wild and wary. There are two essentials in the preservation of a grouse moor. One of these is good water, and the other a judicious periodical burning of the heather. Old woody heather will not produce the

young shoots required for the food of the bird, and much attention has to be paid to renewing it in patches or tracts.

To the owner of a small moor grouse-shooting consists in shooting over dogs; but this form of the sport can only be followed during the early part of the season, before the birds have begun to pack. Later, 'driving' grouse is the only way to obtain a bag. For success in shooting over dogs, the most important point is to study the wind. To rise well, the grouse must breast the wind. Having once felt its wings, its habit is to turn and fly down-wind; and this turning moment is the most favourable for a shot. The dogs engaged in finding it depend also on the wind, and an experienced keeper is guided by the same in mapping out the day's sport. A bright sunny day, with a moderate wind blowing across the line, is the best for shooting over dogs; in wet, rough weather the birds are too alert and wild, and the most sagacious pointers or setters have no chance. Where birds are plentiful, the pointer is the best dog to use; but if scarce, a steady setter ranges farther, and can get over more ground.

In driving grouse, the guns are stationed at well-concealed 'butts' or 'batteries,' generally about eighty yards from one another; and a small army of beaters, in a crescent formation, drive the game towards them, the men being provided with flags to indicate and give warning of the line of flight. Grouse must be driven scientifically, the flanks well guarded, and the lie of the ground and natural line of flight of the birds studied. Much depends upon the sites selected for the batteries, which should be near the 'pitching points' of the grouse. The birds are generally taken at about sixty yards' distance, and coming towards the gun. Only an expert shot can kill his 'right and left,' the velocity of the flight being amazing. The close time for grouse is from 11th December to 11th August, both days included. The opening of the shooting season is universally known as 'the Twelfth.' See *Grouse Shooting* (Fur and Feather Series, 1893); W. A. Adams's *Twenty-six Years' Reminiscences of Scotch Grouse Moors* (1889); T. Cank's *Forty Years Mingled in Game, Fur, and Feather* (1891); Charles Dixon's *The Game Birds and Wild Fowl of the British Islands* (1893).

Grove, SIR GEORGE (1820-1900), English editor, was born at London. Actively interested in Palestine exploration, he was a considerable contributor to Smith's *Dictionary of the Bible*.

Then he edited *Macmillan's Magazine* (1868-83), and *The Dictionary of Music* (4 vols. 1878-89; new ed. by J. Fuller Maitland, 1904, etc.), that 'gave new impetus to musical literature in England.' For over twenty years, from 1852, he was secretary to the Crystal Palace, and with Manns organized the famous concerts there, making the great works of Schumann and Schubert a speciality. He was the first director (1883-94) of the Royal College of Music. See C. L. Graves's *Life and Letters of Sir George Grove* (1903).

Grove, SIR WILLIAM ROBERT (1811-96), British judge and man of science, born at Swansea. The invention (1839) of a new form of voltaic battery, the 'Grove cell,' brought him into notice, and he won a European reputation as a physicist, the *Correlation of Physical Forces* being his great book, first published in 1846. As counsel, he defended Palmer, the Rugeley murderer (1856), and became a judge of Queen's Bench in 1880, retiring in 1887.

Grove Cell. See CELL, VOLTAIC.

Growler (*Grytes salmonoides*), a N. American fresh-water fish which attains a length of more than 2 ft., and is used as food. It belongs to the perch family (Percidae).

Grozni, tn. in N. Caucasus, Terek prov., Russia, 80 m. N.E. of Vladikavkaz; has petroleum wells. Pop. (1897) 15,599.

Grub, a convenient term, used without any very great precision, for the concealed and burrowing larvæ of many insects. A good example is the larva of the cockchafer (*Melolontha vulgaris*). It is vermiform in shape, has three pairs of long and weak thoracic legs, and strong mandibles on the head; wings are entirely absent. From such a grub a typical caterpillar differs in the presence of false legs, or prolegs, on the abdomen, a maggot in the absence of head and all trace of legs. Some grubs are also destitute of legs, but they always have a distinctly differentiated head.

Grub, GEORGE (1812-92), Scottish ecclesiastical historian, born at Old Aberdeen; became lecturer on Scots law at Marischal College, Aberdeen (1843), and (1881) professor of civil law to the university. Joining the newly-founded Spalding Club (1839), he edited, with Dr. Robertson, its first publications, preparing for press Innes's *History of Scotland* (1853); and in 1861 appeared his great work, the *Ecclesiastical History of Scotland*. See *Life*, in *Three Churchmen*, by William Walker (1893).

Grubber, an agricultural implement, also called 'cultivator'

and 'scarifier,' supposed to be an improvement on the harrow, the teeth of which do not penetrate the ground to a sufficient depth. The iron framework of the grubber is raised on wheels, and an apparatus is attached for raising or lowering, according to the depth at which the teeth are required to work; the tines or teeth are curved, and so placed as to enter the ground obliquely when the implement moves forward.

Gruber, JOHANN GOTTFRIED (1774-1851), German author and editor, born at Naumburg (Saxony). He went to Jena as lecturer and joint-editor of the *Allgemeine Literatur-Zeitung* (1805), and in 1815 became professor at Halle, where he originated (1818), in conjunction with Professor Ersch, the stupendous *Allgemeine Encyclopädie der Wissenschaften und Künste*, a work that runs to nearly 200 vols. Gruber's original writings include *Biographies of Wieland* (1815-16) and *Klopstock* (1832), and *Geschichte des Menschlichen Geschlechts* (1806). He also edited Wieland's *Sämmtliche Werke* (1818-28).

Grub Street, described by Dr. Johnson as 'originally the name of a street near Moorfields in London, much inhabited by writers of small histories, dictionaries, and temporary poems, whence any mean product is called Grub Street.' Milton Street is the present name of the thoroughfare. The expression is often used in allusion to the sordid misery of literary hacks.

Grumo Appula, tn., prov. Bari, Italy, 14 m. by rail S.W. of Bari. Pop. (1901) 12,054.

Grün, ANASTASIUS. See AUERSPERG, COUNT.

Grünberg, tn., Prussian prov. of Silesia, 34 m. by rail N.W. of Glogau, with manufactures of cloth, machinery, woollens, and artificial flowers. It is famous for its wine. Pop. (1900) 20,983.

Grundtvig, NICOLAI FREDERIK SEVERIN (1783-1872), Danish theologian, historian, and author, born at Udby, in Zealand. After fiercely assailing rationalism generally in *Kort Begreb af Verdens Krønike* (1812), he in 1825 began a lifelong polemic against unbelief in *Kirkens Gjenmaal*, and founded the *Theologisk Aarsskrift*, the first step towards his projected reformation of the church on a more popular and national basis, and the establishment of what is generally called after him *Grundtvigianism*. This was more or less congregationalism, as free as possible. From 1839 he was pastor of the Vartov Hospital at Copenhagen, with the title of bishop, and held the post till his death. Although he wrote *Nordens My-*

thologi (1808), *Bragesnak* (1841), and *Optrinats Kæmpelivets Undergang i Nord* (1809-11), his most lasting work is embodied in his *Sangverk til den Danske Kirke* (1837-42), *Salmer* (1873-80), *Poetiske Skrifter* (1880-9), *Kristenhedens Syvsterne* (1860; new ed. 1883). See *Grundtvig's Mands Minde* (1877); Kaftan's *Grundtvig, der Prophet des Nordens* (1876); Nielsen's *Grundtvig's religiøse Udvikling* (1889); J. H. Monrad's *Studier over Grundtvigske Digte* (1896); and T. Jensen's *Tolv Foredrag om N. F. S. Grundtvig* (1902).

Grundtvig, SVEND HERSLØB (1824-83), Danish editor, born at Copenhagen, son of the above; became (1869) professor of Scandinavian philology at the local university, and editor of the masterly collection of Danish folk-songs entitled *Danmarks Gamle Folkeviser* (5 vols. 1853-83), *Gamle Danske Minder i Folkemunde* (1854-61), *Danske Folkeeventyr* (1876-8), and *Semund's Edda* (1868).

Grundy, SYDNEY (1848), English dramatist, is a native of Manchester, where he practised as a barrister till 1876. *The Snowball* (1879) was an adaptation from the French, in which direction the greater part of Mr. Grundy's work has lain. His chief plays since then have been *In Honour Bound* (1880), *The Vicar of Bray* (1882), *The Glass of Fashion* (1883), *The Silver Shield* (1885), *Clito* (1886), *The Bells of Haslemere* (1887), *The Pompadour* (1888), *A White Lie* (1889), *A Fool's Paradise* (1889), *A Pair of Spectacles*—an exceptionally skilful adaptation (1890), *Sowing the Wind* (1893), *An Old Jew* (1894), *Slaves of the Ring* (1894), *The New Woman* (1894), *The Late Mr. Castello* (1895), *The Greatest of These* (1895), *The Silver Key* (1897), *The Degenerates* (1899), *The Black Tulip* (1899), *A Debt of Honour* (1900), *Frocks and Frills* (1902), *The Garden of Lies* (1904), and *Business is Business* (1905).

Gruner, WILHELM HEINRICH LUDWIG (1801-82), German engraver, was born at Dresden. His most valuable works are engravings directly from the great Italian masterpieces. From 1852 he was director of engravings in the Royal Museum of Dresden. Among his publications are *Fresco Decorations and Stuccos in Italy* (2nd ed. 1854); *Specimens of Ornamental Art* (1850); and *The Terra-cotta Architecture of N. Italy* (1867).

Grus (= the Crane), a small constellation lying south of Piscis Australis, formed by Bayer in 1604. In English treatises of the early 17th century it is called the Bittern, or Flamingo.

Grus. See CRANE.

Grütli, or RUTLI, meadowland, canton Uri, Switzerland, on w. side of Lake Lucerne, 7 m. N.W. of Altorf; is noted as the traditional meeting-place of Stauffacher, Arnold, Melchtal, Walter Fürst, and thirty others, who, on Nov. 8, 1307, there founded the Swiss League against Austria. The meadow was purchased (1859) by the school children of Switzerland, and is preserved as national property. See Schiller's *Wilhelm Tell*, ii. 2.

Gruyères, tn., Switzerland, 16 m. S.W. of Freiburg. The district is celebrated for its cheeses, but not all the Gruyère cheese is produced here. Pop. (1900) 1,383.

Gryllus, the genus to which the crickets belong.

Gryphius, ANDREAS (1616-64), German dramatist, was born at Glogau. From 1639 to 1644 he lectured at Leyden, and became syndic of the principality of Glogau in 1650. His life was rather sad, and his lyric verse—*Erneuerter Parnassus* (1635) and *Sonn- und Feiertags-Sonette* (1639)—is tinged with melancholy. His tragedies—*Leo Arminius* (1650), *Cardenio und Celinde* (1657), and others—are bombastic and bloodcurdling. He did his best dramatic work in a few comedies: *Peter Squenz* (1657), in which he treats the same subject as Shakespeare did in the comic scenes of *Midsummer Night's Dream*; *Horribilicribrifax* (1655), an amusing picture of the bragging swashbucklers of the Thirty Years' war. In these he shows a bright, natural manner and much wit. His works have been edited by H. Palm (3 vols. 1878-84; and in *Kürschners Deutsche Nationalliteratur*, vol. xxix.). See L. G. Wysocki's valuable *A. Gryphius* (1893).

Gryphius, or GREYFF, SEBASTIAN (1493-1556), German printer, born at Reutlingen in Swabia. He went (1528) to Lyons, where, down to his death, over three hundred books issued from his press, mostly in Hebrew, Greek, and Latin, and in bold italic type; among them, Dolet's *Commentaria Lingue Latine* (1536), a very fine Latin Bible (1550), and the *Theaurus Lingue Sancte* (1529).

Gsell-Fels, THEODOR (1819-98), editor of guide-books, was born at St. Gall, in Switzerland, and became a doctor, but is best known for his series of Italian guide-books.

Guacharo, or OIL-BIRD (*Scaetornis caripensis*), forms the type of a peculiar family, but is related both to the night-jars and to the frog-mouths. It is a nocturnal bird, feeding chiefly on fruits. Breeding is carried on in caves near the sea—e.g. in A. von Humboldt's cave at Caripe, near

Cumana, Venezuela. The fat of the nestlings yields a valuable oil. The bird is found in various parts of S. America, and also in Trinidad.

Guadagnini, an Italian family of violin-makers. The first and most famous, LORENZO (1695-1740, Cremona and Milan), and his son, GIOVANNI BATTISTA (1711-86, Milan, Piacenza, and Turin), were pupils of Stradivarius. Instruments in fine condition by either of these makers realize upwards of £300.

Guadalajara. (1.) Province, Spain, with an area of 4,676 sq. m.; pop. (1900) 200,186. It is watered principally by tributaries of the Tagus, and its produce is mainly agricultural. (2.) City, cap. of above prov., 35½ m. N.E. of Madrid. Its main features are a great military engineering academy, the palace of the Mendozas, the Pantheon in which they are buried, and the semi-Moorish palace of the dukes of Infantado, now an asylum for soldiers' orphans. Some cloth and flannel are manufactured. Pop. (1900) 10,944. (3.) Capital of the state of Jalisco, Mexico, 380 m. N.W. of the city of Mexico. The magnificent cathedral contains a famous Assumption by Murillo; and the theatre, the Degollado, is the largest on the Continent after the New York opera-house. Here are also a university, an art academy, and a mint. Coffee is grown, and paper, Panama hats, and leather are manufactured, and artistic terra-cotta ware is made. Pop. (1900) 101,208.

Guadalaviar, riv. of Spain, rising in Ternel, and flowing S., then E.S.E. for 180 m., S., and then E. into the Mediterranean at Valencia. Its romantic scenery has been immortalized by native poets.

Guadalcanal. (1.) Town, prov. Seville, Spain, 68 m. N.N.E. of Seville. It lies in a beautiful valley of the Sierra Morena, and is the centre of a copper and iron mining district. Pop. (1900) 5,786. (2.) Or GUADALCANAR. See SOLOMON ISLANDS.

Guadalcazar, tn., state of San Luis Potosi, Mexico, 40 m. N.E. of San Luis Potosi; has quicksilver mines. Pop. (1900) 13,000.

Guadalquivir (Arab. *Wady al Kebir*; the *Bætis* of the Romans), riv. of S. Spain, rises in Sierra Morena, flowing S.W. for 370 m., through a great part of Andalusia. It is tidal as far as Seville (70 m.), to which it is accessible for shipping of large tonnage. It flows through *Las Marismas*, or the tidal marshes, into the Atlantic at San Lucar.

Guadalupe, riv. of Texas, U.S.A., flowing S.E. to San Antonio Bay, an arm of the Gulf of Mexico. Length, 250 m.

Guadalupe Hidalgo, tn., Mexico, 3½ m. N. of Mexico; has a collegiate church much resorted to by pilgrims. Here on Feb. 2, 1848, was signed a treaty between the United States and Mexico, by which the latter ceded Upper California and New Mexico to the United States.

Guadarramas, a range of Spanish mountains branching nearly at right angles from the Iberian system near Medinaceli, running W. to the Portuguese coast, and dividing the valleys of Tagus and Douro. The E. end, Sierra de Ayllon, has peaks rising to 7,000 ft.; the centre, or Guadarramas proper, reaches from 5,000 to 6,000 ft. South of Avila the Sierra de Gredos has points with an altitude of 8,730 ft., and the extension to the Portuguese frontier, Sierra de Gata, reaches 6,000 ft.

Guadéloupe, island of French W. Indies, in the Lesser Antilles, lies in 16° N. and 61°-62° W., and is composed of a S.E. plain called the Grande-Terre, united by a narrow isthmus to the N., Basse-Terre, and is surmounted by four cloud-capped mountains. With its dependencies—Marie Galante, Les Saintes, Désirade, St. Barthélemy, and St. Martin—it has a total area of 688 sq. m., with a population (1901) of 182,112. Sugar and coffee are the chief products. Cotton, rubber, cocoa, vanilla, spices, and tobacco are also cultivated, and the forests of Basse-Terre are rich in logwood. In 1905 the imports amounted to £537,520, and the exports to £625,480. Pointe-à-Pitre is the principal seaport.

Guadiana, riv. of S. Spain, rises in the Sierra Morena. Some 30 m. from its source it disappears, and flows by a subterranean passage to the Lancara, which may be considered its head stream. It then flows S. and W. till it reaches a series of lakes, the Ojos (Eyes) of the Guadiana. Its course is then W. to Badajoz, where it bends S. to form the boundary between Spain and Portugal for about 50 m. Thereafter it flows through the Portuguese province of Alemtejo, and enters the Atlantic. Length, 500 m., but it is only navigable a few miles above its mouth.

Guadix, city and episc. see, prov. Granada, Spain, 30 m. N.E. of Granada, on N. slopes of Sierra Nevada. The old cathedral is charming. Pop. (1900) 12,652.

Guaduas, tn., dep. Cundinamarca, Colombia, 45 m. N.W. of Bogota. Pop. 11,000.

Guaiacum, a genus of W. Indian trees from which is obtained by natural exudation or incision the guaiacum resin of the pharmacopœia. This resin, greenish in colour, is used in medicine as a stimulant.

Guaira, LA. See LA GUAYRA.
Guaira Falls. See SETE QUEDAS.

Guajara Bay. See BELEM.
Guido Tadino, tn., prov. Perugia, Italy, 22 m. by rail N. of Foligno. Here in the year 552 Narses defeated and slew Totila, king of the Ostrogoths. Pop. (1901) 10,756.

Gualeguay, tn., prov. Entre Rios, Argentina, 78 m. S.E. of Rosario. It contains soap factories, steam mills, and meat factories. Pop. 10,000.

Gualeguaychu, tn., prov. Entre Rios, Argentina, 12 m. N.W. of the Uruguay. Pop. 15,000.

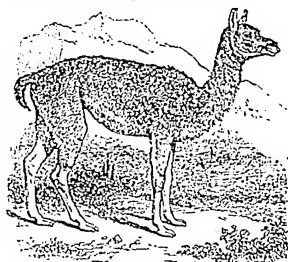
Guam, or GUAHAN, the most southerly and largest island of the Marianne or Ladrone archipelago, lat. 13° 26' N., long. 144° 40' E. It was ceded by Spain to the United States in 1898, and is a United States naval station. It has an area of 225 sq. m. Pop. 9,000. Its cap. is Agaña (pop. in 1900, 6,200).

Guamo, tn., Tolima, Colombia, S. America, at the confluence of the Magdalena and Saldaña. Pop. about 12,000.

Guan (*Penelope*) is a name given to certain S. American game-birds related to the curassows. The throat and chin are generally naked, with a wattle, and there is a bare space round the eye. The colours are usually brown or olive-green, and the birds, which are social, are confined to forest regions.

Guanabacoa, tn., Cuba, 10 m. E. of Havana. Pop. (1899) 13,965.

Guanacaste, prov., Costa Rica, is situated in the N.W., and includes the Nicoya Peninsula. Its area is 4,000 sq. m. There are valuable forests and good grazing land. Pop. (1897) 18,000. The cap. is Guanacaste, or Liberia, with a pop. of 2,850.



Guanaco.

Guanaco, or HUANACO (*Acchena huanacrus*), one of the two wild members of the camel family in S. America. It is believed to have been the progenitor of the domesticated alpaca and llama. It is a larger and more heavily built animal than the vicuña, and has a more extended range, being found from Ecuador and Peru to Patagonia and Tierra del Fuego.

Guanajay, tn., Cuba, 22 m. W.S.W. of Havana; is a health resort. Pop. (1899) 8,796.

Guanajuato, cap. of state of Guanajuato, Mexico, 170 m. N.W. of Mexico city. It is Oriental in appearance. Its chief building is the Alhondigade Granaditas, built for a commercial exchange, but now used as a prison. Guanajuato is the centre of one of the richest mining districts (silver, gold, mercury, tin, lead, and copper) in Mexico, and is noted for its pottery. The town was partially destroyed by great floods in July 1905. Pop. (1900) 41,486.

Guanare, chief tn., state of Zamora, Venezuela, 220 m. S.S.W. of Caracas. Pop. estimated at 11,000.

Guanches, or GUANCHOS, the original race found in the Canary Is. by the Spaniards, who completed their subjugation about 1500. They are now almost extinct. Their language and inscriptions show some affinities to the Berbers of N. Africa, while, like the Egyptians, they embalmed the bodies of their dead. In the shape of the skull they approached the Cro-Magnon race of France—subdolichocephalic, forehead low, and jaws projecting. See *Jour. of the Anthropological Institute*, vol. xviii. (1888); Berthelot's *Antiquités Canariennes* (1879).

Guane, or GUANES, tn., prov. Pinar del Rio, Cuba. Pop. (1899) 14,700.

Guanine, $C_5H_5N_5O$, is a complex nitrogenous compound of basic character that is allied to uric acid, and found in guano and other animal products. It is extracted from guano, and forms a white powder that is insoluble in water.

Guano. This valuable manure consists of the excreta of fish-eating sea-fowl, such as gulls, cormorants, and penguins, and of walruses, seals, and the like, together with other animal remains, as birds' feathers and bones. It possesses a pungent and characteristic odour, and varies in colour from light to dark brown. The chemical composition of guano is extremely complex, and differs with the locality of the deposit. The main constituents are nitrogenous (uric acid) and phosphatic (calcium phosphate), but potassium salts are present, together with urate, oxalate, ulmate, phosphate, carbonate, sulphate, and chloride of ammonium, and a nitrogenous compound called 'guanine,' $C_5H_5N_5O$. In hot and rainless regions the nitrogenous matter is preserved by natural desiccation, so that its ratio to phosphatic matter remains high; in damp climates it is almost entirely decomposed into ammonium salts,

and is lost by drainage and vaporization. In the former case nitrogenous and in the latter phosphatic guano results. The most highly nitrogenous and therefore most valuable guano (containing nitrogen from 13 to 14 per cent., and phosphoric acid from 13 to 14 per cent.) has been imported into Great Britain since 1839 from the Chincha and other islands off the coast of Peru. Nitrogenous guano of an inferior quality is imported from Ichaboe and other islands off the coast of German S.W. Africa, and small shipments have been made from Patagonia and the Falkland Isles. Phosphatic guanios exist on the Bolivian coast (phosphoric acid 33 per cent., and nitrogen 0.9 per cent.), the Abrolhos and various Pacific islands, and in New Caledonia.

The high manurial value of guano is due to the fact that it is a general fertilizer, yielding all the constituents of plant food in a condition that can be readily assimilated. Unfortunately, the best supplies are now practically exhausted. In 1835 the total annual imports into Great Britain were 200,000 tons, but in 1905 they had fallen to 29,223 tons. Altogether over 5½ million tons have been imported. Low grades are now 'rectified,' or 'fortified,' with ammonium sulphate.

Guantanamo, tn. in the S.E. of Cuba, 13 m. N. of its port, Caimanera. Coffee is grown, and sugar and timber are exported. Pop. (1899) 28,063.

Guaporé, or ITENEZ, riv., S. America, rises in W. of Brazil, flows N. past Matto Grosso, and forms the boundary between Brazil and Bolivia, till it unites with the Mamore and falls into the Madeira. It is navigable for small craft from its mouth to Matto Grosso, about 100 m. from its source.

Guarana, or BRAZILIAN COCOA, a medicinal preparation derived from the seeds of a S. American tree, *Paullinia sorbilis*. These seeds contain an alkaloid, 'guanine,' identical with caffeine. By crushing and purifying the seeds, and making the mass into little cakes, a sort of chocolate is obtained. This, mixed with sugar and water, is taken as a beverage in Brazil.

Guarani, the most widespread of the S. American aborigines, whose domain originally comprised a great part of Central and S. Brazil, Paraguay, Bolivia, Argentina, and Uruguay. Jointly with the kindred Tupi, they constitute the Tupi-Guarani family, which further comprised most of the eastern seaboard south of the Amazon estuary, and reached inland to the eastern slopes of the Peruvian Andes. It was a dialect

of the Tupi-Guarani stock language that was adopted by the Jesuit missionaries as the general medium of intercourse between themselves and the natives throughout the greater part of the southern continent. Their astonishing expansion appears to be mainly due to peaceful migratory movements. Physically the Guarani are a robust but somewhat

Guarantee, a guarantee or promise to answer for the debt or default of another must, under the Statute of Frauds, be in writing, signed by the guarantor; but the consideration need not be stated (Mercantile Law Amendment Act, 1856). The liability of the promisor is collateral and not primary; otherwise the transaction is not one of guarantee,

has had to pay, he has a right of contribution against the others. (See also **INDEMNITY**.) In Scotland a 'mercantile guaranty' is a form of cautionary obligation, and must be in writing, and is applied to an obligation by which one person engages himself for another.

Guarantee Associations differ from insurance societies in that the risks which they guarantee against can be largely avoided by careful inquiry. The most numerous guarantee associations, sometimes called fidelity-guarantee associations, are those which guarantee the integrity or the solvency of employes. Other societies, more common in the United States than in Great Britain, guarantee titles to land, investments in stocks, mortgages, rents, payment of trade debts, etc.

Guarayos, S. American aborigines, who roam the forests of E. Bolivia. They are noted for their florid complexion and full beards. Although they cultivate maize and plantains, the Guarayos are described by some observers as a fierce and barbarous people, unamenable to all civilizing influences.

Guarda. (1.) District of Portugal, forming part of prov. Beira Alta, with an area of 2,116 sq. m., and pop. (1900) 261,630. (2.) Town and episc. see of Portugal, chief tn. of above dist., stands on a spur of the Serra da Estrella, 105 m. by rail N.E. of Coimbra; has a castle and a cathedral, and manufactures woollens. Pop. (1900) 6,092.

Guardafui, the N.E. extremity of the 'eastern horn of Africa,' 11° 50' N. and 51° 20' E., at the S. of the entrance to the Gulf of Aden.

Guardi, FRANCESCO (1712-93), Venetian painter, pupil of Canaletto. His works greatly resemble those of his master, whose designs he sometimes coloured. Heworked with great rapidity, stimulated partly by his love of money. The finest of his works are perhaps those in the Manfrini Palace at Venice.

Guardiagrele, city, prov. Chieti, Italy, 18 m. S.W. of Ortona. Pop. (1901) 9,500.

Guardian, THE, English weekly newspaper, which has long been recognized as the leading organ of English Churchmen, was founded in 1846 by Dean Church, William Ewart Gladstone, and others. Its purpose was to express the views of 'Anglo-Catholics,' and it at once attracted ready support from the High Church party. It has always exercised a great influence in political matters where they touch the interests of the English Church as an establishment.



Guarani of South America.

undersized race, with round and rather flat features, slightly oblique eyes, and a yellowish complexion, giving them that Mongolic expression which has been noticed by most observers. At present full-blood Guarani are nowhere numerous; those settled by the Brazilian government in reserves are nearly all half-castes.

and need not be in writing. If the principal creditor gives further time to, surrenders securities to, or discharges, the principal debtor, the guarantor (or surety) is, as a rule, discharged. If the surety pays the debt, he is entitled to have handed over to him all the securities held by the principal creditor. Where there are two or more sureties, and one

Guards. In the British army there are four regiments of Foot Guards. The premier regiment, although not the oldest, is the **GRENADIER GUARDS**, which was raised in 1660 by Colonel Russell, and became the bodyguard of Charles II. After Waterloo the Prince Regent bestowed upon it the title of the First or Grenadier Regiment of Foot Guards. The **COLDSTREAM GUARDS** were formed by General Monek in 1650 from two of Cromwell's regiments; at the restoration the name of 2nd (Coldstream) Foot Guards was adopted. The **SCOTS GUARDS** date back to 1660, when two or three regiments of foot soldiers were raised by the Earl of Linlithgow. Under Mr. Haldane's new army scheme of 1906 the 3rd battalion of this regiment was disbanded (July 1906). All three regiments have taken a brave and honourable part in most of the great British battles of the 18th and 19th centuries, and in the late S. African war. The **IRISH GUARDS** were formed in 1900 to complete the brigade of Foot Guards by the formation of an Irish regiment, in recognition of the gallantry of the Irish soldiers in the S. African war. Another famous regiment of guards was the **Swiss Guard** formed in France in 1616, which was massacred in defending Louis XVI. in the Tuileries, 1792. Reorganized in 1815, it was finally disbanded by Charles X. in 1830.

Guarini, GIOVANNI BATTISTA (1537-1612), author of the celebrated drama *Pastor Fido* (1590; Eng. trans. 1602), born at Ferrara; was a contemporary of Tasso, and courtier successively to the dukes of Ferrara, the Medici, and the house of Urbino. The book is a brilliant work, reflecting the manner of life, the vices, and superficialities of the age. See Rossi's *B. Guarini ed il Pastor Fido* (1886).

Guarneri, the surname of an eminent Italian family of violin-makers who worked at Cremona. **ANDREA** (c. 1630-95) was a pupil of Nicolo Amati, but in his later period modified the form of the *f* holes, and used a less arched model than his master.—**JOSEPH**, *filius Andreae* (c. 1680-1730), introduced a new form of waist curve, adopted the pointed Brescian type of *f* holes, and set them lower in the instrument.—**PETRUS** (c. 1690-1725), the second son of Andrea—Cremona and Mantua—among other innovations increased the width between the *f* holes; his instruments are more highly esteemed than those of Andrea or Joseph.—**PETRUS** (c. 1725-60), a son of Joseph—Cremona, Mantua, and Venice—followed his uncle's model to some extent, and produced some very fine violins.—The greatest genius

of the family, **GIUSEPPE ANTONIO** (1683-1745), was a nephew of Andrea. His violins, which date from 1740 to 1745, are usually of massive build, have a rich, sonorous tone, and for concert purposes are considered by many to equal in every respect the best productions of Antonio Stradivari.

Guarroman, tn., prov. Jaen, Spain, 4½ m. from Linares; is a lead-mining centre. Pop. (1900) 3,402.

Guastalla, anc. tn. and episc. see of Italy, prov. Reggio Emilia, 19 m. by rail N.E. of Parma, and on the r. bk. of the Po. Here the Franco-Sardinians defeated the Austrians in 1734. Pop. (1901) 11,091.

Guatemala. (1.) Republic of Central America, bordering on the Pacific and the Atlantic, between Mexico, Salvador, and Honduras. It is mostly mountainous, with small coast strips of low land. The soil is very fertile. Two-thirds of the inhabitants are of pure Indian race, being descendants of the Maya and kindred tribes. Agriculture (coffee, tobacco, sugar, bananas, cocoa, wheat, maize, beans, and india-rubber), timber-felling, and cattle-grazing are their occupations. A few sugar and cigar factories, and weaving factories of coarse cloth, supply the home market. The value of the exports in 1905 was £1,647,551 (coffee representing seven-eighths of the total exports), and of the imports £1,368,889. The expense of administration formerly exceeded the revenue, and the total indebtedness amounted in 1904 to £2,907,298. The religion is the Roman Catholic, but other forms are tolerated. More than 80 per cent. of the people have received no education. (See also **CENTRAL AMERICA**.) Conquered by the Spaniards between 1522 and 1524, it was a Spanish province down to 1821. In 1825 a federal constitution was adopted. The decisive defeat of Honduras, Salvador, and Nicaragua by Guatemala at La Arada (1851) prevented the formation of a new confederation, and from that date down to 1865 Carrera was virtually dictator of Guatemala. In 1871 a more liberal régime was begun, the Jesuits were banished, and the power of the clericals was crippled. Further efforts for Central American confederation led to an unsuccessful war with Nicaragua, Costa Rica, and Salvador in 1885. Area estimated at 48,300 sq. m. Pop. (1903) 1,842,134. See Brigham's *Guatemala, the Land of the Quetzal* (1887); Niederlein's *The Republic of Guatemala* (Philadelphia Commercial Museum, 1898); and Seler's *Wissenschaftliche Ergebnisse seiner Reise durch Guatemala* (1901, ff.). (2.) G. LA NUEVA, cap. of the re-

public of Guatemala, situated in the basin of the Motagua, on the N. flank of the volcanic coast cordillera. The chief buildings are the cathedral, government house, and a university. Its port is San José, on the Pacific. The town was removed (1773) to its present site from the valley of the Panchoy, where the ruins of La Antigua still stand. Pop. (1898) 74,000.

Guatusos, Central American aborigines, southernmost branch of the Chorotegan family, whose territory is in Costa Rica. They are a peaceful agricultural people.

Guava (*Psidium Guayana*), a low-growing W. Indian tree belonging to the family Myrtaceæ. It bears white flowers, followed by fragrant, yellow, fleshy fruits, extensively employed for the making of preserves and jellies. In Britain it can be only grown as a stove plant. The guava also grows in the E. Indies; and there is a Chinese variety, *P. cattleianum*, 'the strawberry guava.'



Guava, and Fruit.

Guaviare, riv., Colombia, S. America, rises in the Andes, and flows E. for over 700 m. to join the Orinoco on the l. bk. It is navigable for small steamers for about 600 m.

Guayaquil. (1.) Chief port, episc. see, and most important town in Ecuador, S. America; stands on the river Guayas, and above the Gulf of Guayaquil. It contains a fine cathedral (built of wood), government buildings, a bishop's palace, and a university. Yellow fever is very prevalent. There is a good harbour, protected by a breakwater. A railway from Duran, opposite Guayaquil, runs to Quito (286 m.). The chief exports are cocoa, coffee, quinine, gold, silver, and hides. Pop. (1900) about 50,000. (2.) **GULF OF**, an inlet on the W. coast of S. America, crossed by 3° S. lat.; is the only important break on the W. coast of the continent N. of Chile. There are two entrances, one on each side of the island of Puna (32 m. by 12 m.); both are beset by shifting sandbanks.

Guaycurus, S. American aborigines, chiefly in the Gran Chaco. They are probably of Guarani stock.

Guayra. See LA GUAYRA.

Guazuma, a genus of evergreen tropical American trees, belonging to the order Sterculiaceae. *G. ulmifolia* is sometimes grown in a peaty compost as a stove tree in Britain. This species has powdery leaves and stems, and bears axillary cymes of yellow and white flowers.

Gubbins, or GUBBINGS, the local name given to a community of savage people inhabiting the neighbourhood of Brent Tor, Devonshire, in the 16th and 17th centuries and previously. They were the prototypes of the 'naked people, living in holes of the earth,' who figure in Blackmore's *Maid of Sker* (1872). They defied the laws of England, and maintained their own separate tribal life, being ruled over (according to Kingsley's *Westward Ho!*) by a 'king of the Gubbings.'

Gubbio, mkt. tn. and epise. see, prov. Perugia, Italy; stands among the Apennines, 68 m. by rail W.S.W. of Ancona. An ancient and mediæval city, it possesses a 13th-century cathedral, an imposing palace of the dukes of Urbino (14th century), a museum which contains the Eugubine Tables (Umbrian inscriptions), and other old buildings. It represents the ancient Iguvium, and was formerly famous for its majolica. The annual procession of the Ceri takes place on May 15. Pop. (1901) 26,718.

Guben, tn., prov. Brandenburg, Prussia, stands on the Neisse, 30 m. by rail S.E. of Frankfort-on-the-Oder; manufactures woollens, hats, leather, machinery, etc. Pop. (1900) 33,122.

Gubernatis, ANGELO DE. See DE GUBERNATIS.

Gude, HANS FREDRICK (1825-1903), Norwegian painter, was born in Christiania. Schooled in the romantic ideals of Düsseldorf (from 1841), he became professor at the academy there (1854), then went to Karlsruhe as professor in the arts school (1864), and in 1880 (till 1901) began to teach landscape painting in the academy at Berlin. He loved sun and free air, and painted by preference coast scenes of his native Norway. His most noteworthy pictures include *Bridal Procession on the Hardanger Fjord*, *Fishers on a Norwegian Lake* (at Berlin), *Fishing by Night* (at Vienna), *Fishermen Landing* (at Dresden), *A Calm Sea* (at Cologne), *A Viking Ship and After the Storm* (both at Berlin). See Dietrichson's *Af Hans Gude's Liv og Verker* (1899).

Gudgeon (*Gobio*), a cyprinoid fish related to the barbel. The British species is *G. fluviatilis*.

Like its allies, it is a purely animal-feeder, and is a small fish with a short spineless dorsal fin.

Gudiatham, or GUDIYATTAM, munic. tn., N. Arcot, Madras, India, 16 m. N.W. of Vellore, with weaving. Pop. (1901) 21,335.

Gudrun, or KUDRUN, old German epic, embodies the legends of the North Sea shores among the Hegelings (Frisians). Like the *Nibelungenlied*, the existing form is comparatively late, dating from the 12th century. The best edition is that by Martin (1902); and there are translations into modern High German by Simrock (1873) and Legerlotz (1900).

Guelderland. See GELDERLAND.



Guelder Rose.

1, Single flower; 2, fruit.

Guelder Rose, or SNOWBALL TREE, of the genus *Viburnum*, especially applied to *V. opulus*, with flat cymes of white flowers in summer, followed by red, globose fruit. The double variety of this plant, *V. o. sterilis*, is the guelder rose of British gardens. In this variety the flowers are all sterile, and the inflorescence is globular.

Guelf and Ghibelline, terms derived from the names of two German princely houses—the Welf and Waiblingen—who struggled for the imperial dignity in the early part of the 12th century. Frederick of Hohenstaufen, the Waiblingen, was successful. The Ghibellines were chiefly found among the feudal German land-

owners, while the Guelfs were the Latin dwellers in the Lombard and Tuscan towns who struggled for independence, though other Italian cities—as Pisa, Lucca, and Arezzo—were imperialist. The Guelf towns formed an alliance with the papacy, and for a century struggled with Frederick, his son Henry VI., his grandson Frederick II., and the latter's illegitimate son Manfred. After many defeats, they were ultimately victorious, when Charles, Count of Anjou, was called in to aid the Guelfs against Manfred (1266). Still there were brief recrudescences of imperialism during the Italian expeditions of Henry VII. (1311-12), and of Louis of Bavaria (1327-8).

Both parties had, however, absorbed quarrels and feuds from other sources—the contests of city against city, of family against family, so that many towns were Ghibelline merely because a hated rival was Guelf. Many towns, too, constantly varied from Guelf to Ghibelline, and back again, according to the party in power. The confusion was increased by the mixture of ecclesiastical with communal politics, since there were even Ghibelline popes who were opposed to the Guelf towns and kings of Naples. The names, however, lasted on through the 13th and into the 14th century, when they were practically banned by ecclesiastical censure. From the house of Guelf, through the dukes of Saxony and of Brunswick-Lüneburg, is descended the house of Hanover, which, since 1714, when George I. came to the throne, has been the reigning family of Great Britain. See Browning's *Guelfs and Ghibellines* (1893).

Guelf, chief tn. in Wellington co., Ontario, Dominion of Canada, 48 m. W. of Toronto. It is the seat of the Ontario Agricultural College. The town was founded by John Galt, the Scottish novelist. Pop. (1901) 11,496.

Guercino, IL (i.e. the squint-eyed), the nickname of GIOVANNI FRANCESCO BARBIERI (1590-1666), born at Cento, Ferrara, was patronized by Pope Gregory XV. His chief works are frescoes in the cathedral at Piacenza, pictures in Rome and Bologna, in the Pitti Palace at Florence, and the National Gallery, London. He executed a large number of less artistic works, now at Bologna, Dresden, and the Louvre. He died at Bologna, where he had settled in 1642, and where he founded a school of painting.

Guéret, cap. of dep. Creuse, France, 186 m. S.S.W. of Paris, at the foot of the Puy de Gandy. It grew up round the St. Pardoux monastery (8th century). Pop. (1901) 8,083.

Guericke, HEINRICH ERNST FERDINAND (1803-78), German theologian, a notable champion of the Old Lutheran school, born at Wettin; he held a professorship in the University of Halle from 1829. Besides his well-known *Handbuch der Kirchengeschichte* (1833; 9th ed. 1866-7; Eng. trans. *Manual of Church Hist.*, 1857), he wrote *Christliche Symbolik* (1839) and *Lehrbuch der Christlichen Archäologie* (1847; Eng. trans. *Manual of the Antiquities of the Church*, 1851).

Guericke, OTTO VON (1602-86), German physicist, born at Magdeburg, and was burgomaster of that town from 1646 to 1651. He made notable discoveries on the nature of air and electricity, also in astronomy, the chief of which are found in his *Experimenta Nova* (1672; new ed. 1881). He invented the air-pump (1650), and made a crude barometer and an electric machine. He also wrote an account of the great siege by Tilly, *Geschichte der Belagerung ... Magdeburgs* (1631). See F. Dies's *Otto von Guericke* (1892; new ed. 1887); F. W. Hoffman's *Otto von Guericke* (1874).

Guerilla Warfare is a species of petty hostilities (*guerrilla* is the diminutive of *guerra* = 'war') carried on by bands of men who are loosely organized as soldiers, but often subsist mainly by plunder. The Spanish irregulars who fought against the French in 1808-14 were deemed 'guerrilleros.' In 1870-1 the Germans treated as spies the *francs-tireurs* who acted as guerrilleros. The British, however, in 1899-1902 regarded the Boers at all times as regular soldiers.

Guérin, EUGÉNIE DE (1805-48), French authoress, sister of Georges Maurice de Guérin (1810-39), was born near Albi. Both were mystics of a high order; but while he was akin to the great pagans, she finds her place among the Catholic saints. After her brother's death she devoted herself to collecting and editing his *Reliquie* (ed. G. S. Trébutien, 1860). Her *Journals and Letters* (1862; Eng. trans. 1865) were translated into English. See Marelle's *E. et M. de Guérin* (1869); Harriet Parr's *M. and E. de Guérin* (1870).

Guérin, PIERRE NARCISSE, BARON (1774-1833), French painter, born at Paris, studied under Regnault, though he also came under the influence of David. He gained his first success with *The Return of Marcus Sextus* (1800), and followed it up by *Phedra accusing Hippolytus* (1802). Still drawing inspiration from the antique and from tragic motives, he painted *Orpheus at the Tomb of Eurydice*, *Andromache* (1810), *Cythemnestra* (1816), *Æneas and Dido* (1817). His *Bonaparte par-*

doing the Rebels at Cairo (1810, now at Versailles) was much criticised. In 1814 he was appointed professor of painting at the Fine Art School in Paris, and in 1822 director of the French school at Rome, where he died.

Guernica, tn., prov. Vizcaya, Spain, 20 m. by railway, E.N.E. of Bilbao. Here the Basque folk-motes were held. Pop. (1900) 3,250.

Guernsey, second largest of the Channel Is., 25 sq. m. in area, lies 110 m. S. of England. The highest point reaches only 350 ft. above sea-level. The island produces large quantities of fruit (grapes, tomatoes, etc.) and early vegetables (potatoes, etc.). Blue granite is quarried. Some 57½ per cent. of the soil is farmed by peasant proprietors. Mean ann. temp.—February 43° F., July 60½° F.; mean annual rainfall 37½ in. There is a good port at the chief town, St. Peter Port, where Victor Hugo resided from 1852 to 1870. Administratively, Alderney, Sark, and Herm—area about 3 sq. m.—belong to Guernsey. Pop. of Guernsey (1901), 40,477; of Alderney and the smaller isles (1901), 2,568.

Guernsey Lily (*Nerine Sarniensis*), a beautiful bulbous plant, belonging to the order Amaryllidaceæ, is generally grown as a greenhouse or conservatory plant, in a soil composed of fibrous loam, sand, and leaf-mould. It bears many-flowered scapes of pink flowers in autumn.

Guerrazzi, FRANCESCO DOMENICO (1804-73), Italian author, born at Leghorn. His historical novel, *The Battle of Benevento* (1827), made him famous. Constantly engaged in republican conspiracies, he was imprisoned at Porto Ferrajo, Elba, where he produced a second historical novel, *L'Assedio di Firenze* (1836), his most important work. Called by Montanelli to be minister to Leopold II., grand-duke of Tuscany, he was overthrown on the flight of the duke, and imprisoned (1847) for three years. On his release he distinguished himself by his bitter hostility to Cavour. His other works include *Apologia della Vita Politica di Guerrazzi* (1851), *Memorie* (1848), and *Vita di Andrea Doria* (1863; 3rd ed. 1874). Carducci edited his *Letters* (1880-82). See G. Ricucci's *Guerrazzi, Leopardo, etc.* (1899).

Guerrero, state in S.W. of Mexico, with the Pacific on the S.W. It is mountainous and fertile, yielding grain, coffee, and tobacco. Minerals are abundant, but are little worked. Chilpancingo is the capital; Acapulco is the seaport. Area, 24,996 sq. m. Pop. (1900) 475,594.

Guerrini, OLINDO. See STECCHETTI, LORENZO.

Guesclin, BERTRAND DU (c. 1320-80), Constable of France, was born in Brittany. He was distinguished in youth by his prowess in all contests of strength and skill; defended Rennes against the Duke of Lancaster (1356-7); and subsequently conducted the defence of Dinan, but was taken prisoner by Sir John Chandos in 1364. Released on a heavy ransom, he proceeded to Spain, where he fought for Henry of Trastamare against Pedro the Cruel, and was taken prisoner by Edward the Black Prince in 1367. Once more ransomed, he became Constable of France in 1370, and thenceforward fought against the English. See *Lives* by Guyard de Berville (new ed. 1882), Jamison (1863), and Postel (1893); and Luce's *Histoire de B. du Guesclin* (1876).

Guest, EDWIN (1800-80), English antiquary and historical writer, born at King's Norton, Worcestershire. On a visit to Weimar he became acquainted with Goethe. One of the founders of the Philological Society (1842), he was elected Master of Caius College, Cambridge (1852). He is best known by his *History of English Rhythms* (1838; new ed. 1882). His other works are *On Julius Caesar's Invasion of Britain* and *The Campaign of Aulus Plautius in Britain* (both in *Trans. Philol. Soc.*). Two volumes of his papers were published (1833) by Dr. Stubbs and Rev. C. Deedes, entitled *Origines Celliæ*.

Guest, LADY CHARLOTTE (1812-95), collector of fans and china, was a daughter of the ninth Earl of Lindsay. She published volumes containing facsimiles of her most notable fans, and the playing cards of all nations; and presented a collection of china and earthenware to the South Kensington Museum. She also published old Welsh MSS. with translations, notably the *Mabinogion* (1838-49; new ed. 1902).

Guettarda, a genus of ever-green tropical American trees and shrubs belonging to the order Rubiaceæ. They are worth growing in stovehouses, both for their foliage and salver-shaped flowers. A peaty soil suits them best.

Gueux, LES, or BEGGARS OF THE SEA, the appellation of certain of the patriot party of the Netherlands in their struggle against Spain in the 16th century. The name was adopted as an honorific one from a term of abuse flung at them in the presence of the regent Margaret of Parma in 1566, after they had protested against the introduction of the Inquisition into the Netherlands. One body of the Gueux, who became known as the Beggars of the Sea, fitted out privateers, and under the

leadership of Count de la Marek, harassed Alva's communications, and by their capture of Briel (1572) they won the first success in the struggle which eventually resulted in the independence of the Netherlands. See Moke's *Les Gueux de Mer* (1885); Kervyn de Lettenhove's *Les Huguenots et les Gueux* (1883-6).

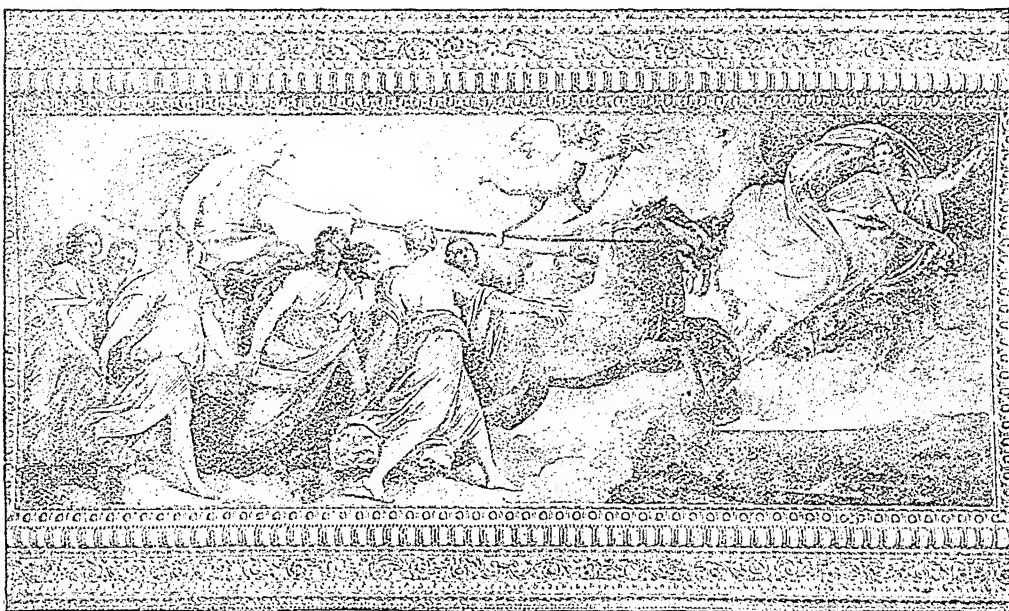
Guevara, ANTONIO DE (1490-1545), Spanish ecclesiastic and philosopher, bishop of Mondoñedo, born at Viscaya; was confessor and chronicler of the Emperor Charles V. His didactic writing had an extraordinary vogue throughout Europe, being in respect of its affected and bombastic style the forerunner, if not indeed the actual model,

Cojuelo (1641)—the original of Le Sage's *Diable Boiteux*—in which a poor student makes friends with an imp, who for his pleasure lifts the roofs from the houses of Madrid, and exposes the secret life of the inhabitants.

Guglielmi, PIETRO (1727-1804), Italian musical composer, born at Massa di Carrara, became a prolific writer of operas, serious and comic, also of chamber music and masses. For many years he was popular in German cities and in London, as well as in Italy, where he became (1793) musical director to the Vatican. He belongs to the age of petty formalism, known as *style perruque*. His best known operas are *La Didone*; *Due Gemelli*; *La Bella Pescatrice*.

and after the assassination of Alexander he secured the election of Cosimo de' Medici (1530), but soon afterwards retired into private life. The remaining years of his life he spent in writing his *Istoria d'Italia* (1492-1530), first published in 1561; best ed. by Rosini (10 vols. 1819; Eng. trans. 1879). He wrote also *Ricordi Politici e Civili* (Eng. trans. *Counsels and Reflections*, 1890), *Reggimento di Firenze*, and *Storia Fiorentina*. See Giorda's *Guicciardini e le sue Opere Inedite* (1880), Benoist's *Etude sur Guichardin* (1862), and Zanoni's *Vita Pubblica di F. Guicciardini* (1896).

Guiccioli, COUNTESS THERESA (1802-73), daughter of Count



Fresco by Guido Reni—"Aurora." In the Rospigliosi Palace, Rome.

of the 'euphuism' of the English writer Lyly. His *Reloc de principes o Marco Aurelio* (1529) was turned into English (*Golden Book of Marcus Aurelius*) by Lord Berners (1534). *Epistolae familiares* (1574 and 1575), also Englished, was one of the most fashionable books of the period. See Hume's *Spanish Influence on English Literature* (1905).

Guevara, LUIS VELEZ DE (1570-1644), Spanish novelist and dramatist, was born at Ecija in Andalusia, and became court chamberlain to Philip IV. He wrote a vast number of plays, the best being *Mas pesa el Rey que la Sangre*; but he is principally known as the author of a very brilliant social satire, *El Diablo*

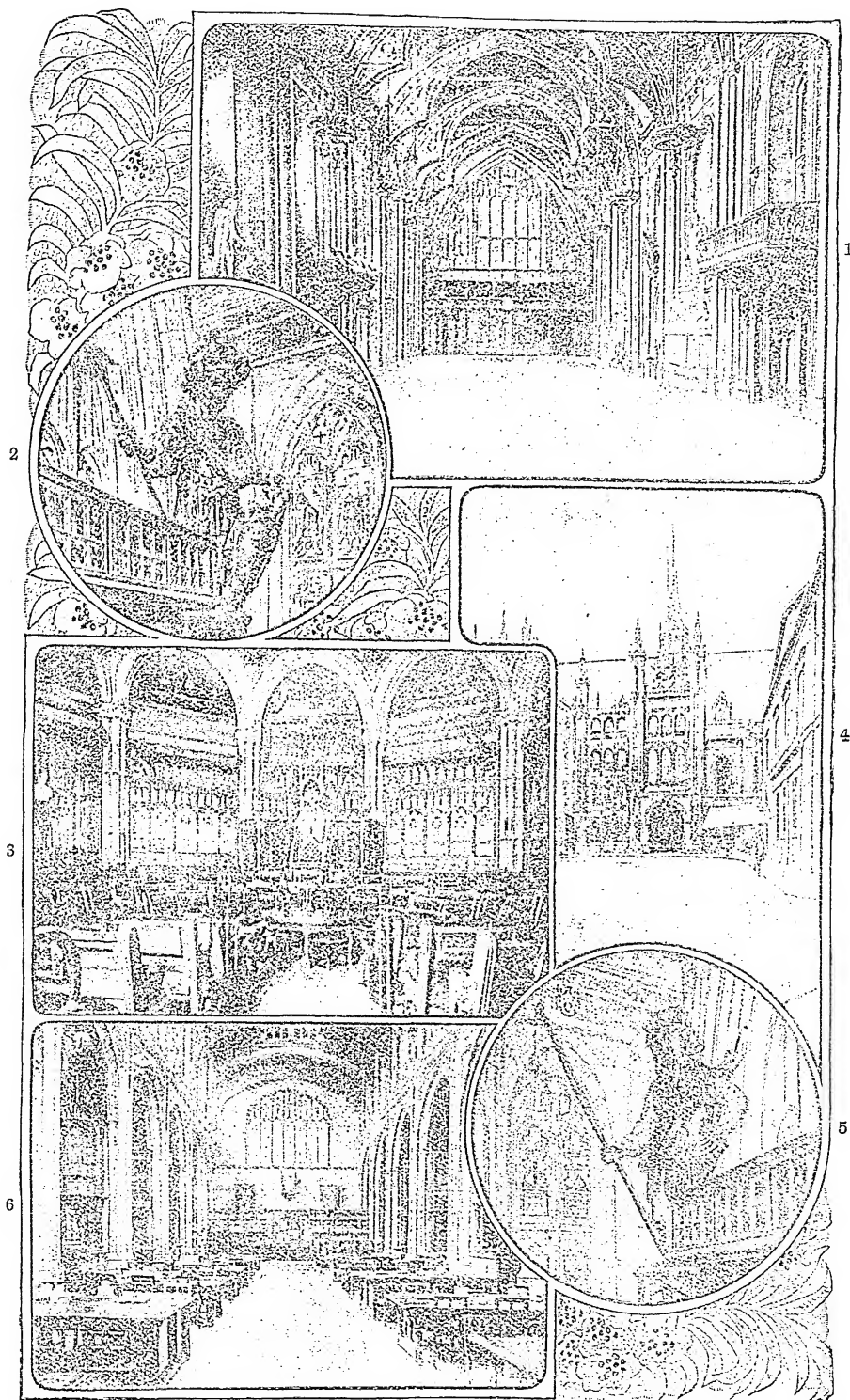
Guiana. See BRITISH, DUTCH, and FRENCH GUIANA.

Guibert of Nogent (1053-1124), French Benedictine historian and theologian, born near Beauvais; abbot of Nogent-sous-Coucy (1104). He wrote a history of the first crusade, *Gesta Dei per Francos*; also an *Autobiography*, and religious treatises.

Guicciardini, FRANCESCO (1483-1540), Italian historian, born at Florence. He was sent on a delicate mission to Ferdinand of Spain, after which Pope Clement VII. made him governor of the turbulent Romagna. Interesting himself in the affairs of Florence, he acted as councillor to Duke Alexander, gaining for him the favour of Charles V.;

Gamba of Ravenna, married the aged Count Guiccioli (1818), but three days later became enamoured of Lord Byron, and wrote *My Recollections of Lord Byron* (1869), an exaggerated panegyric.

Guide-books are a comparatively recent innovation. The first guide-books, in the strict sense of the word, were Ebel's *Anleitung für Switzerland* (1793), Galignani's *Picture of Paris* (1814), Boyce's *Belgian Traveller* (1815), and Mrs. Starke's *Directions for Travellers on the Continent* (1820). A *Guide to the English Lakes*, by Wordsworth, was published in 1822. Baedeker first issued his series of guides in 1828, and Murray followed in 1836. Other high-class guide-books are



The Guildhall, London.

1. The Guildhall. 2. 5. The 'City Giants,' Gog and Magog. 3. The Council Chamber. 4. The King Street frontage. 6. The Library.

those published by A. and C. Black, Ward, Lock, and Co. (*Illustrated Guide Books*), Dulau (*Through Guides*, by Baddeley and Ward), Stanford (*Tourists' Guides*), Macmillan (*Highways and Byways*), Adams (*Bradshaw's Illustrated Handbooks*), the French series (*Guides-Joanne*), and the German guides to Italy of Gsell-Fels.

Guides, in the British army, were officers who directed the ceremonial march of soldiers down to 1890, but the duty of 'selecting points to march on' is now left to sergeants who are squad commanders.

Guidi. See MASACCIO.

Guido d'Arezzo, or GUIDO ARETINUS (990-1050), a Benedictine monk, born probably near Paris, who made many reforms in musical notation, and to whom many others are wrongly attributed. He probably invented the principle upon which the staff is based; and at Pomposa, near Ferrara, taught the new method with great success. He wrote numerous works (ed. Gerbert, 1784), explaining his improvements, including *Micrologus*, the *Antiphonarium*, and *De Artificio Novi Cantus*. See Kieseewetter's *Guido von Arezzo* (1840).

Guido Reni (1575-1642), Italian painter, born at Calvenzano, Bologna. He became a pupil of the Carracci. Towards 1602 he went to Rome, and after twenty years' residence there returned to his native town, where he founded an atelier. Guido's early works have an imposing, almost violent character, resembling the manner of the naturalistic Caravaggio. Some of his best works in this class are the *Crucifixion of St. Peter*, in the Vatican; the *Madonna della Pietà*, the *Crucifixion*, the *Massacre of the Innocents*, at Bologna; and *St. Paul the Hermit and St. Anthony in the Wilderness*, in the Berlin gallery. While in Rome he adopted a style remarkable for its softness and grace. The chief works belonging to this period are the large fresco in the garden pavilion of the Rospigliosi Palace at Rome, which is generally considered his masterpiece; and the *Nativity*, in the choir of S. Martino at Naples. In the latter part of his life Guido often painted with careless haste. Several of his works are in the National Gallery, London.

Guienne, or GUYENNE, former prov. of France, watered by the lower Garonne and Dordogne. With Gascony, it was the ancient Aquitania, of which Guienne is a corruption. By the marriage of Henry II. of England with Eleanor of Aquitaine (1152) Guienne became English, but re-

verted to France at the end of the Hundred Years' war.

Guignes, JOSEPH DE (1721-1800), French Orientalist, born at Pontoise, in 1753 was elected member of the Académie des Belles-Lettres. For thirty-five years he edited the *Journal des Savants*. Chief work: *Histoire générale des Huns, des Turcs*, etc. (1756-8); though he also wrote *Mémoire dans lequel on prouve que les Chinois sont une Colonie Egyptienne* (1759-60).

Guild. See GILD.

Guildford, munic. bor. and co. tn. of Surrey, England, 30 m. s.w. of London. The church of St. Mary, built of flint and chalk, contains curious frescoes. The town hall dates from 1683, a grammar school from 1509, and a hospital for aged persons, founded by Abbot, archbishop of Canterbury, from 1619. The principal object is the Norman keep of the old castle, with walls ten feet thick below. During the Plantagenet period it was an occasional royal residence. Pop. (1901) 15,938.

Guildford, NICHOLAS OF. See OWL AND NIGHTINGALE.

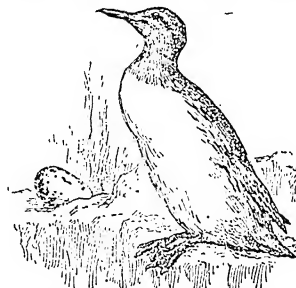
Guildhall, an edifice in the city of London, long identified with civic conclaves, and with the feasts of the corporation. Price's *Guildhall* (1886) outlines its past history and architectural vicissitudes. It was involved in the great fire, and the edifice as it now stands dates only from 1789; it was designed by George Dance. The ancient crypt is notable (see cut in Loftie's *London City*, 1891). In a general sense guildhall means the hall in which the guilds or corporations usually assemble—the town or corporation hall.

Guilford Court House, battlefield, Guilford co., N. Carolina, U.S.A., 5 m. N.W. of Greensboro, where, on March 15, 1781, was fought an indecisive battle by the British, under Cornwallis, and the Americans, under Greene.

Guillemia, a genus of tropical American palms, with hairy, feather-like leaves, and spiny trunks and leaf stalks. They bear clusters of large edible fruits, especially *G. utilis*, and like a sandy loam containing peat and leaf mould.

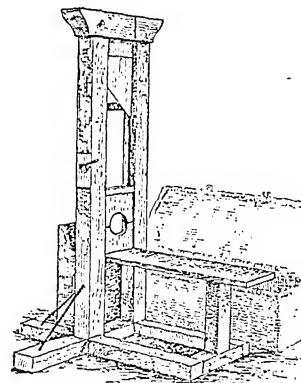
Guillemin, AMÉDÉE VICTOR (1826-93), French critic and popularizer of science, was born at Pierre, Saône-et-Loire; wrote popular books on physics and astronomy, such as *Le Ciel* (1864; 5th ed. 1871); *La Soleil* (1873); *Les Phénomènes de la Physique* (1867); *Le Monde des Comètes* (1877); *L'Électricité et le Magnétisme* (1891)—all translated into English; though his most comprehensive work is *Le Monde Physique* (5 vols. 1880-5).

Guillemots are members of the auk family. The common guillemot (*Uria troile*) breeds in Britain. The bill is long, straight, and strong, the wings and tail short. In spring the upper surface of the body is brownish black, the under white, save for the dark throat; in winter the throat becomes white or mottled. Much



Common Guillemot and Egg.

less common, except in the far north, is the black guillemot (*U. grylle*), while the third British species (*U. Bruennichi*) is not more than an occasional visitor. All the guillemots lay only a single pear-shaped egg. The three species named are widely distributed, being especially abundant in the Arctic regions.



Guillotine.

Guillotine. (1.) An instrument employed for the purpose of decapitation; was officially introduced into France, as the means of inflicting capital punishment, in April 1792. It was named after its reputed inventor, Dr. Joseph Ignace Guillotin, who, contrary to popular belief, died a natural death, and not a victim to his own invention. The instrument consists of two upright posts held together at the top by a cross beam, the former being perpendicularly so grooved as to allow of the falling in a direct line of a broad steel blade.

whose edge is cut obliquely. The latter, sometimes weighted with lead, descends upon the neck of the criminal immediately that the cord which holds it up is released by the executioner. (2.) A machine, similar in name and in general construction to the above, employed by bookbinders. It is used for cutting paper and trimming the edges of books after the sheets have been sewn together.

Guimarães, tn., prov. Minho, Portugal, 25 m. S.E. of Braga, grows wine, manufactures cutlery, paper, and linen. From the 11th century down to 1511 it was the capital of the kingdom. Pop. (1900) 8,863.



Guinea of Charles II.

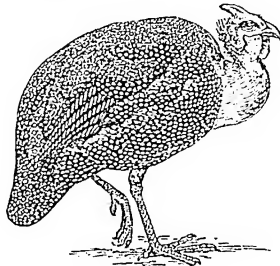
Guinea, an English gold piece, first struck in the reign of Charles II., for the most part from gold obtained in Guinea. It maintained its place as the principal English gold coin till 1817, when the sovereign was introduced. The value of the guinea varied from 30s. in 1695 to 21s. in 1717. Many payments are now made in guineas representing a value of 21s., although there is no current coin of the name. Those guineas which on the reverse bear a spade-shaped shield with the royal arms are called 'spade guineas.'

Guinea, FRENCH and PORTUGUESE. See FRENCH GUINEA and PORTUGUESE GUINEA.

Guinea, GULF OF, on the W. coast of Africa, between Cape Palmas (S.E. of Siberia) and Cape Lopez, about 1° S.; receives the counter-equatorial current, which crosses the Atlantic on or near the equator, and itself sends out the equatorial current which traverses the ocean in the opposite direction and eventually gives rise to the Gulf Stream. The gulf forms two open bays, known as the Bight of Benin and the Bight of Biafra.

Guinea Fowl, the African representatives of the pheasants, from which they differ in that the plumage of both sexes is alike. The origin of the domesticated stock is *Numida meleagris*, from W. Africa. A number of other species occur in other parts of Africa. In the black guinea fowl (*Phasidus niger*), which ranges from Cape Lopez to Loango, spurs are present in the male as in pheasants. Guinea fowl are nearly all gregarious, are

ground-feeders, and roost in trees. Most species seek to escape danger by running rather than by



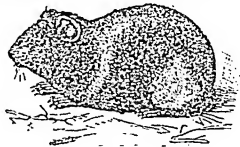
Guinea Fowl.

flying. As in the turkeys, parts of the head and neck are without feathers, and these bare patches are often highly coloured.

Guinea Grass (*Panicum maximum*), a perennial tropical W. African grass, highly esteemed in its native lands and in the W. Indies and United States as a fodder plant. It grows from eight to ten feet in height.

Guinea Pepper. See BELL PEPPER.

Guinea Pig, a domesticated rodent. Probably it has arisen from Cutler's cavy (*Cavia Cutleri*), domesticated by the Incas of Peru. Guinea pigs were introduced into Europe by the Dutch in the 16th century; but while the wild cavy is in colour uniform or dull, the guinea pigs are usually white, or white marked with yellow and black. Like the wild cavy, they have four toes on the fore feet and three on the hind, the tail is absent, and the ears are small. Pretty though stupid creatures, guinea pigs have always been favourite pets with children, and are extraordinarily prolific, being very hardy if kept in dry and warm situations.



Guinea Pig.

Guinea Worm. See FILARIA.

Guinegate, or ENGUINEGATTE, vil., dep. Pas-de-Calais, France, 10 m. from St. Omer. Here in 1479 the troops of Louis XI. of France were defeated by Maximilian, Archduke of Austria, and in 1513 Henry VIII. of England and Maximilian defeated the French. The latter battle is called 'the Battle of the Spurs.'

Guines. (1.) Town, dep. Pas-de-Calais, France, 6 m. S. of Calais; has trade in butter and eggs. Close by took place, in 1520, the meeting in the 'Field

of the Cloth of Gold,' between Henry VIII. of England and Francis I. of France. Pop. (1901) 4,157. (2.) Town, prov. Havana, Cuba, 40 m. by rail S.E. of the capital. It has trade in sugar and coffee. Pop. (1899) 11,394.

Guinevere, wife of King Arthur. The Welsh *Triads* know three ladies of this name, each of whom was wife to Arthur; and the *Merlin* relates that the queen had a half-sister of the same name, born out of wedlock, who closely resembled her. In the prose *Lancelot* we find that this lady succeeded, by a daring ruse, in causing the banishment of the real queen, whose place she usurped. This seems to point to a mythic origin of the character, and a famous adventure attributed to Guinevere—that of being abducted by a rejected lover, variously named Melwas, Meleagant, or Falerin, and imprisoned in a mysterious castle under conditions which recall the abode of the dead or other world—appears to favour this conclusion. The tradition of Guinevere's infidelity to her lord is an early feature of the story. In Geoffrey and his translators her lover is Mordred; but the romance writers represent the queen as having no share in Mordred's treachery. At a comparatively late stage of Arthurian evolution Guinevere was provided with a new lover in the person of Lancelot, who is not mentioned in the earliest documents, and this *liaison* became the central point of Arthurian romance in its latest development. The writings of Malory and Tennyson have made this story familiar to English readers. See LANCELOT DU LAC.

Guingamp (anc. *Gicampum*), tn., dep. Côtes-du-Nord, France, 18 m. W. of St. Brieuc. From the 14th to the 17th century it was the capital of the duchy of Penthièvre. The mediæval church of Notre Dame de Bon Secours is a much-frequented place of pilgrimage. The town gives its name to guingham, which is still manufactured. Pop. (1901) 9,252.

Guinicelli, GUIDO (c. 1230-76), Italian poet, was born at Bologna. He became a judge in his native town, and in 1270 podestà of Castelfranco. However, he was banished as a Ghibelline in 1274, and died in exile. His poems deal exclusively with love. He began by imitating the Provençals and Sicilians; but later his thought deepened, and his poetry became remarkable for the beauty of the images employed. He founded a school of poets at Bologna. The best edition of the poems will be found in Casini's *Rime dei Poeti Bolognesi del sec. XIII.* (1881), pp. 3-73. See, too, Grion's *G. e Dino Compagni*.

Guinness, a family of Dublin brewers. In 1759 ARTHUR GUINNESS, by purchasing the St. James's Gate brewery, Dublin, founded the family fortunes. His grandson, SIR BENJAMIN LEE GUINNESS, became sole proprietor of the brewery in 1855, and built up an enormous export trade. He was lord mayor of Dublin (1851), M.P. for Dublin city, and a notable public benefactor, having restored St. Patrick's Cathedral, Dublin, at a cost of £150,000. Of his sons, the eldest, SIR ARTHUR EDWARD GUINNESS (1840), was created Baron Ardilaun (1880); while the youngest, EDWARD CELIL GUINNESS (1847), received a baronetcy (1885), and a peerage with the title of Baron Iveagh (1891). In 1889 he founded the Guinness Trust Funds, London and Dublin. The Guinness brewery was made a limited liability company in 1886, with a capital of £6,000,000.

Guinobatan, inland tn., prov. Albay, Luzon, Philippine Is. Pop. (1898) 20,500.

Guipuzcoa, prov. N. Spain, one of the Basque provinces. It is mountainous, produces maize, timber, cattle, etc., and has factories of paper and matches. Iron-founding and mining are carried on. Its capital is San Sebastian. Area, 728 sq. m. Pop. (1900) 195,850.

Guiraud, ERNEST (1837-92), French musical composer, born at New Orleans, U.S.A.; won the Grand Prix de Rome at the Paris conservatoire, the successful piece being *Bajazet et le Joueur de Flûte* (1859). His first opera, *Le Roi David*, had been produced at New Orleans in 1852. Taking up his residence in Paris, he taught composition at the conservatoire (1880). His operas include *Sylvie* (1864), *Le Kobold* (1870), *Madame Turlupin* (1872), *Galante Aventure* (1882), and *Frédérigonde*, completed by Saint-Saëns (1895).

Guiraut de Borneil (c. 1138-c. 1220), Provençal troubadour, known as 'master of the troubadours,' was born at Excidenil (Dordogne). He accompanied Richard Cœur de Lion on the third crusade. He wrote many tender love poems in honour of a Gascon lady—some eighty poems in all. Only a few of these have been edited critically—e.g. by Kolsen (1894). Guiraut's finest qualities are the simplicity and directness of his late work.

Guisborough, mkt. tn., North Riding, Yorkshire, England, 49 m. N. of York. Alum shale abounds. The Augustine priory, now in ruins, was built in 1119. Pop. (1901) 5,650.

Guiscard, ROBERT (c. 1015-85), Duke of Apulia and Calabria,

was a son of the Norman Tancred de Hauteville, and was born near Coutances in Normandy. Proceeding to Italy whilst still young, he was made Duke of Apulia in 1056. In 1081 he carried an army across the Adriatic, and defeated the Byzantine emperor, Alexius Comnenus, at Durazzo. Thence he was recalled to protect the Pope against the Emperor Henry IV. He stormed and plundered Rome, freed the Pope from the castle of San Angelo (1084), and took him to Salerno for safety. Then returning to the east, he defeated the fleet of the allied Byzantines and Venetians near Corfu in 1085, but died at Cephalonia whilst preparing to march on Constantinople.

Guise, tn. and health-resort in dep. Aisne, France, on the Oise, 25 m. N. of Laon; has ancient church and ruined castle, the former seat of the dukes of Guise. It has a stove-foundry. Pop. (1901) 7,310.

Guise, a French noble family, originating in Lorraine.

(1.) CLAUDE (c. 1496-1550), its founder, fifth son of René II, Duke of Lorraine, accompanied Francis I. in his Italian campaign, later winning distinction in Flanders and elsewhere. His daughter married James V. of Scotland, and was mother of Mary Queen of Scots. Originally Count of Guise (in Picardy), he was created duke in 1527.

(2.) FRANCIS, second duke (1519-63), was lieutenant-general of France, and its virtual master for a number of years. He defended Metz (1552) against Charles V. and recovered Calais (1558) from the English. He was the bitter opponent of the Huguenots, whom he defeated at Dreux (1562). He was assassinated at Orleans.

(3.) CHARLES, the famous cardinal of Lorraine (1524-74), his brother, was archbishop of Rheims at fourteen, and in 1547 cardinal. He administered the finances of France during three reigns, and introduced the Inquisition.

(4.) HENRI, surnamed Le Balafré, third duke (1550-88), distinguished himself at Jarnac (1568) and Moncontour (1568) against the Huguenots. He superintended the massacre of St. Bartholomew in 1572, and was the head of the Catholic League, formed in 1576, and violently opposed the succession of Henry IV. to the French throne. In 1588 he was assassinated by the royal archers at Blois.

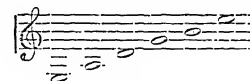
(5.) HENRI, fifth duke (1614-64). On the overthrow of Masaniello at Naples, in 1647, he won the crown, but very soon lost it again. The house finally became extinct on the death of Marie,

Duchess of Lorraine, in 1688. See Fornoron's *Les Ducs de Guise* (2nd ed. 1893).



Guitar.

Guitar (Span.), a musical stringed instrument related to the lute. While retaining the flat breast and large circular sound-hole of the lute, it has a flat back, with bent sides, which in its modern form curve inward a little above the centre. The guitar has six strings—the upper three of gut, and the others of silk covered with spun wire, the strings being tuned to the notes



as music for the instrument is written in the treble clef; but all notes produced are in reality an octave lower than written. Like the lute, the guitar is played by plucking the strings with the thumb and fingers of the right hand, while the fingers of the left hand, by pressing the strings on a fretted fingerboard, regulate the pitch. Before the invention of the piano the guitar was much used in accompaniments to the voice.

Guittone of Arezzo (c. 1230-94), Italian poet, born at San Firmiano, near Arezzo; entered the order popularly known as the Frati Gaudenti (1269). About 1285 he was at Bologna, and then in Florence. His poetical works are sharply divided into two periods. The first contains love poems of a somewhat uninspired though manly kind; the second, didactic pieces, and such as dealt with contemporary political events. Valeriani's edition (1828) was supplanted by the complete critical edition of Pellegrini (1901, etc.). Twenty-two prose epistles belonging to Guittone's second period are among the earliest monuments of Italian prose. They have been edited by Bottari (1745), with a valuable *Life*.

Guizot, FRANÇOIS PIERRE GUILLAUME (1787-1874), French statesman and historian, born at Nîmes. Coming to Paris in 1805, he soon began to contribute to *Le Publiciste*, and became known

in literary society. In 1812 he was elected to the chair of modern history in the University of France. On the fall of Napoleon he was appointed secretary-general of the interior in Louis XVIII's first administration, being promoted to the council of state (1816). He now came to the front as a leader of the party of the 'Doctrinaires'—Liberal Moderates, who advocated a *juste milieu* between Republican extremes and Legitimist reaction. On the fall of the Duc Decazes ministry (1821) he was deprived of all offices, and in 1825 even his lectures were prohibited. For the next five years he was conspicuous as an opponent of Charles

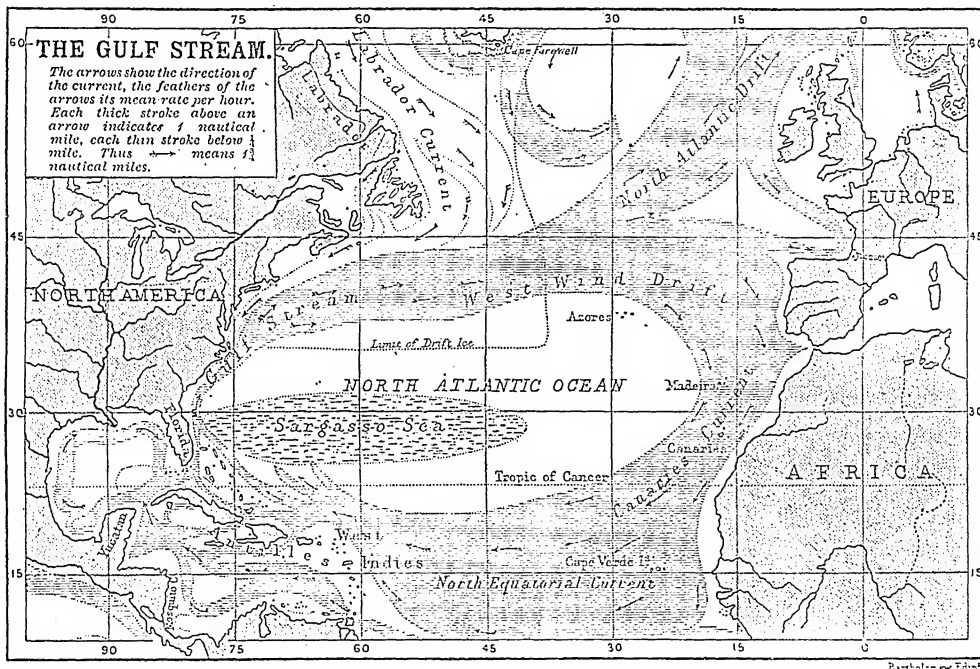
sistently encouraged the *entente cordiale* with England. The revolution of 1848, largely brought about by his refusal to make the concessions demanded by the spirit of the age, was the end of Guizot's political life. His chief works are *Histoire de la Révolution d'Angleterre* (2 vols. 1826-7; continued in 6 vols. 1850-6; Eng. trans. by A. R. Scoble, 6 vols. 1854-6); *Histoire de la Civilisation en Europe* (1828; Eng. trans. new ed. 1896); *Histoire de la Civilisation en France* (5 vols. 1829-32; Eng. trans. 1846); *Histoire de France Racontée à mes Petits Enfants* (5 vols. 1870-5); *Vie, Correspondance et Ecrits de Washington* (1840; Eng. trans. 1840).

India, 75 m. N.W. of Lahore. The town is noted for its inlaid work in gold and iron, and for its manufacture of brass vessels. Pop. (1901) 19,410. Area of dist. 41,536 sq. m.; pop. (1901) 750,548.

Gujranwala, chief tn. of dist. of same name, Punjab, India, 40 m. N. of Lahore. Birthplace of Runjeet Singh, founder of the Sikh kingdom. Pop. (1901) 28,356. The district has an area of 3,017 sq. m., and pop. (1901) 756,797.

Gulbarga. See KULBARGA.

Gulden, a silver coin and monetary unit, used in Germany and the neighbouring states (e.g. Austria and Holland) since the middle of the 17th century.



x's government. In 1830 Guizot entered the Chamber; on the fall of Charles X. he was included in the first cabinet of Louis Philippe, and on its reconstruction (1832) became minister of public instruction. Here he became the true father of modern educational organization in France. Now began his rivalry with Thiers, and when the latter became minister for foreign affairs (1840), Guizot accepted for a time the post of French ambassador in London, where he was warmly welcomed by English society. But the same year he was recalled by the king, and entrusted with the task of forming a new ministry, which lasted for eight years, and con-

See his own *Mémoires pour servir à l'Histoire de mon Temps* (9 vols. 1858-68; Eng. trans. same dates), Jules Simon's *Thiers, Guizot, etc.* (1885), and Bardoux's *Guizot* (1894).

Gujarat, GUJRAT, or GUZERAT. (1.) Maritime prov., Bombay, India, comprising the Kathiawar peninsula, Baroda, and other native states. It is crossed by the Vindhya and Satpura Mts., and is drained by the Narbada and Tapi. Its products are cotton, rice, wheat, maize, and tobacco. Total area, 70,038 sq. m. Pop. (1901) 11,270,314. Excluding native states and agencies, the area is 14,400 sq. m., and the pop. (1901) 4,361,666. (2.) Chief town of Gujarat district, Punjab,

It was generally divided into 60 kreuzer, each worth 4 pfennig, and was itself equivalent to two-thirds of a thaler, or nominally 1s. 4d. to 2s. Thus it ranked with the guilder and the florin.

Gules, in heraldry, is the colour, or tincture, red.

Gulf Stream, oceanic current in the N. Atlantic, derives its name from the Gulf of Mexico. The chief cause of its existence is the heaping up of the waters of the warm equatorial current in the Gulf of Mexico. Thence they find their way out through the Strait of Florida as a strong, swift current, from 50 to 100 m. wide, 2,000 feet deep, and with a speed of from two to five miles an hour. Proceeding N. along the E. coast

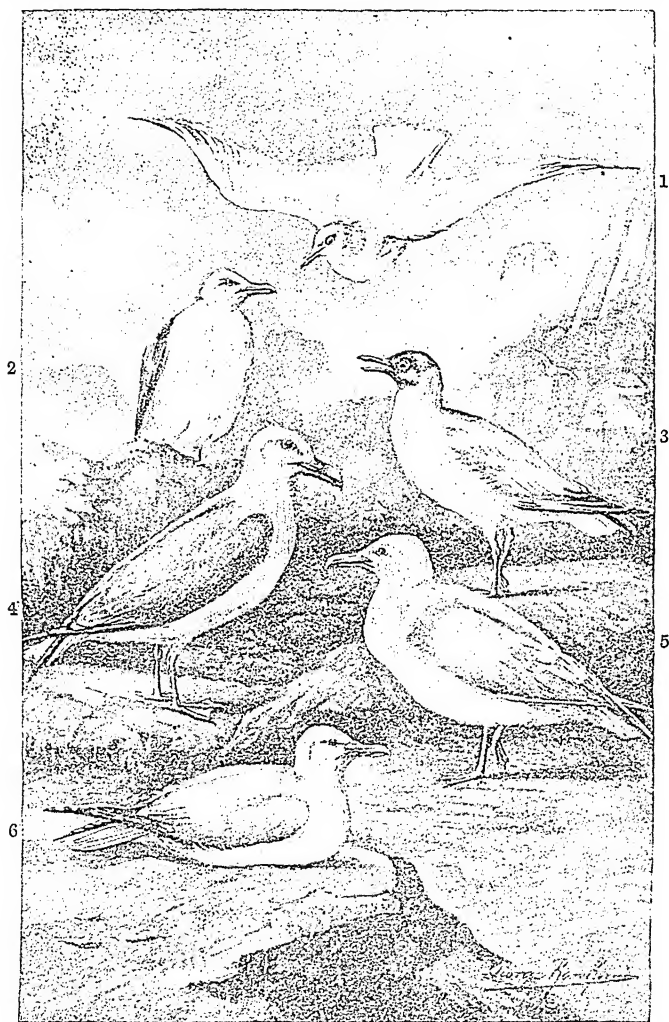
of the United States, this current gradually spreads out, its rate of flow diminishing, and its mean surface temperature dropping from over 80° F. to about 73°. Off Newfoundland it merges into the great Gulf Stream drift, or general movement E. of the surface waters of the Atlantic—a movement maintained princi-

one between Greenland and Iceland, a second between Iceland and the Faroe Is., and the third between the Faroe Is. and the Shetlands. These last two branches pass round the North Cape, and then gradually die away towards Novaya Zemlya and the White Sea. It is to this current, or rather drift, of warm superficial

of the family Laridae, which includes gulls, skuas, skimmers, and terns. Gulls are essentially marine birds, in spite of the fact that not a few species nest inland. The upper half of the beak is longer than the lower, over which its tip is bent down; the tail is usually square. Most of the familiar forms belong to the type genus *Larus*. One of the commonest is the black-headed gull (*L. ridibundus*), which frequents flat, marshy shores, and is almost omnivorous; the black or rather dark-brown hood is lost in autumn. The large and handsome herring gull (*L. argentatus*) is widely distributed; the so-called common gull (*L. canus*) is only common at certain times and in certain places. Large colonies of the lesser black-backed gull (*L. fuscus*) are to be found in spring on upland moors near sheets of water. In some parts of Scotland the great black-backed gull (*L. marinus*) is abundant. This and the glaucous gull or burgomaster (*L. glaucus*) are the largest British species.

Gull, SIR WILLIAM WITHEY (1816-90), English physician, born at Colchester. He was appointed lecturer on medicine at Guy's (1856); but his increasing practice compelled him to resign his lectureship in 1865. In 1872 he was created a baronet by Queen Victoria in recognition of the skill and care bestowed by him upon the Prince of Wales (now Edward VII.) during his attack of typhoid fever. His success was largely due to his powers of diagnosis, and the care with which he examined every case. He published 'Hypochondriasis and Abscess of the Brain' (in Reynolds's *System of Medicine*); *Reports on Epidemic Cholera* (1854); *Arterio-capillary Fibrosis* (1872); *On a Cretinoid State in Adults* (1873), distinguishing for the first time the disease now known as myxoedema.

Gullet, or **ŒSOPHAGUS**, is the muscular tube through which food travels from the pharynx to the stomach. About nine inches in length, it descends along the front of the spine, and passes through the diaphragm, to terminate at the cardiac end of the stomach. Except when distended by food, it is collapsed, its upper part being flattened, while the lower is rounded. In structure the gullet presents three coats—a muscular, a cellular, and a mucous element. Compound racemose glands occur throughout the whole length of the gullet, but are most numerous at its lower end. The canal is narrowest at its junction with the pharynx, and at the point where it pierces the diaphragm. In the act of swallowing, the con-



Species of Gulls.

1. Common gull. 2. Lesser black-backed gull. 3. Black-headed gull. 4. Great black-backed gull. 5. Glaucous gull. 6. Herring gull.

pally by the prevailing w. or s.w. winds. In about 20° W. long. the drift divides, one branch sweeping S. down the coast of Spain and the W. coast of Africa; the other, turning to the N., washes the W. coasts of the British Isles, and finally passes into the Arctic by three arms—

water that the comparative mildness of the winters in Norway and N.W. Europe is in the main due. The Gulf Stream properly so called has little to do with this phenomenon.

Gulf Weed. See **SARGASSO SEA**.

Gull, a name applicable to the members of the sub-family Larinae

traction of successive rings of circular muscular fibres thrusts the food stomachward. The most common cause of stricture of the gullet is malignant disease, which frequently occurs at the cardiac end. Tumours and enlargements of neighbouring organs occasionally, by pressure on the œsophagus, give rise to obstruction and difficulty in swallowing.

Gully, JOHN (1783-1863), prize-fighter, was champion of England in 1806. At various times a publican, breeder of race-horses, and colliery proprietor, he represented Pontefract in Parliament from 1832-7.

Gully, WILLIAM COURT, VISCOUNT SELBY (1835), late Speaker of the House of Commons, was born in London, and called to the bar (Inner Temple) in 1860 (Q.C. 1877). From 1886-1905 he represented Carlisle, and in 1895 was elected to the Speakership, which position he occupied with conspicuous ability till his resignation in June 1905. Mr. Gully was raised to the peerage, and received a pension of £4,000 per annum. He is the first Speaker who, since Cromwell's time, it is believed, has been obliged to call in the aid of the police to compel obedience to his authority. This was on March 5, 1901, when several Irish members who had been suspended refused to leave the chamber.

Gulo. See GLUTTON.

Gulpaigan, tn., prov. Irak-Ajemi, Persia, 100 m. N.W. of Ispahan. Pop. about 5,000.

Gum is a term applied to a number of widely differing substances of a more or less sticky nature. The gums proper are almost entirely obtained from plants, and dissolve in water to a more or less perfect solution, and are hydrolyzed to sugars by boiling with dilute acids. Typical examples are tragacanth, gum arabic, agar-agar, and Iceland-moss gum. The gum resins are also obtained from plants, and contain a certain amount of true gum, but are chiefly important on account of the resins and essential oils that are present, and are insoluble in water. They are of very different natures, and are exemplified by ammoniacum, gamboge, asafetida, myrrh, etc. Gum benjamin, or benzoin, and some similar substances also called gums, are in many respects like the gum resins; but as they contain no true gum, they are better classed as balsams. British gum is a strong solution of the commercial mixture known as dextrin, obtained by heating, or acting with acids, etc., on starch, and, like the true gums, is largely used as an adhesive and thickening agent in calico printing, etc. Gums are also employed in pharmacy

and bacteriology as vehicles and culture media. Chewing gum consists principally of paraffin wax mixed with sugar and various flavouring ingredients; whilst the 'gums' given by oils when exposed to the air are oxidation products.

Gumal or Gomul Pass crosses the Sulaiman range from 160 to 170 m. S.W. of Peshawar, and connects India with Afghanistan. Two important Afghan caravan routes converge at the pass.

Gumbinnen, tn., Prussian prov. of E. Prussia, 73 m. by rail E. of Königsberg, with large horse markets. It produces woollens, linens, and cotton goods. Pop. (1900) 14,000.

Gumboil, an abscess in or near the socket of a tooth, generally due to dental caries. In all cases of gumboil free evacuation of the pus is followed by immediate relief from pain, and by speedy repair of the inflamed tissues.

Gummel, tn. of Bornu, Africa, in N. Nigeria, 70 m. N.E. of Kano. Pop. 12,000.

Gummersbach, tn., Prussian Rhineland, 27 m. E. by N. of Cologne, with cotton and woollen industries. Pop. (1900) 12,525.

Gumming, a disease which attacks the vine, plum, peach, cherry, and other trees. It is very contagious, and is due to a fungus, *Coryneum Beijerinckii*, which converts the cell-walls and contents into gum, as in the production of gum arabic. This disease, which is often due to an excess of manure, should be treated by thorough and frequent washing of the trees; but it is best to destroy them.

Gumti, riv., United Provinces, India, running in a S.E. direction for 480 m., and joining the Ganges about 25 m. below Benares.

Gümürjina, or GUMURZHINA, tn., vilayet, Adrianople, Turkey in Europe, 70 m. S.W. of Adrianople. Wine is manufactured, and there is a large cattle fair. Pop. 20,000.

Gümüş-Khaneh, tn., vilayet, Trebizond, Asiatic Turkey, 44 m. S.S.W. of Trebizond. Silver, lead, and copper ores are worked. Pop. 3,000.

Gun. See GUN LICENCE, GUN-MAKING, GUN-METAL, GUNNER, GUNNERY, GUNNERY SCHOOLS (Naval), GUNPOWDER, GUN PRACTICE, GUNROOM, GUNS (1) sporting, (2) naval, (3) military, (4) machine.

Gunboat. See NAVIES.

Gun-cotton, the hexanitrate of cellulose, $C_{12}H_{11}O_4(NO_3)_6$. The first satisfactory method of preparation was devised by Schönbein in 1845. The cotton is carefully cleaned, combed, and dried, and then immersed in a mixture of strong nitric and sulphuric acids in the proportion of one

part of the former to three parts of the latter, the sulphuric acid being employed to take up the water formed in the reaction. When the cotton is completely 'nitrated,' it is removed from the acid mixture, and all traces of free acid are carefully washed away. The gun-cotton is now pulped, and afterwards compressed into cakes of the required form and dimensions. Gun-cotton has much the same appearance as the cotton it is prepared from, but is harsher. It is insoluble in ether-alcohol, and is unaffected by water, but when wet is much less sensitive to exploding influences than when dry. It is usually detonated with fulminate of mercury, and is largely used for blasting purposes in the military service. Gun-cotton is also a component of cordite and other smokeless and blasting powders, an example of the last-named being tonite, a mixture of gun-cotton and nitrate of barium. See Guttmann's *Manufacture of Explosives* (1895).

Gundamuk. See GANDANAK.

Gundelia, a one-species genus of Asiatic composite plants. *G. Tournefortii* has thistle-like leaves and large, handsome purple flowers.

Gunduck. See GANDAK.

Gun Factory. The Royal Gun Factory is situated at Woolwich, where it forms a department of the Royal Arsenal. Here a considerable proportion of the guns for the army are manufactured, together with the limbers, carriages, ammunition wagons, etc.

Gungl, JOSEPH (1810-89), Hungarian composer, was born in the county of Pest, and was a band-master in the Austrian army from 1835 until 1843, when with a private band he toured over the Continent and America. He was appointed director of music to the king of Prussia (1849), and to the emperor of Austria (1853). Gungl's compositions possess the attractive qualities of tuneful melody and well-defined rhythms.

Gunib, a mountain stronghold in Daghestan, 120 m. E.S.E. of Vladikavkaz, 7,718 ft. above the sea. The sides fall precipitously for from 500 to 1,000 ft., except on the E., where there is a descent through a chasm. Here Shamil maintained himself from 1851-9.

Gun Licence. Under the Gun Licences Act, 1870, no person may carry a gun, including a firearm of any description, outside a dwelling in Britain without a yearly ten-shilling licence. The penalty is £10. But officers in the performance of their duty, persons with game licences, occupiers of land or their servants scaring birds or killing vermin (which does not include rabbit-shooting), and gunsmiths, are exempted.

Gun-making. In their general features and construction all B.L. (breech-loading) and Q.F. (quick-firing) guns (artillery) are in the main similar. The modern gun varies in length from 28 to 47 calibres, and is provided with a swell at the muzzle to give extra strength at a point where strong vibratory action is set up by the projectile leaving the bore. The chamber at the base of the inner tube (A tube) is somewhat enlarged, so as to admit of facility in loading, and to give a certain amount of 'air space' to the propelling agent. With all guns in the British service the method adopted for opening and closing the breech is the same—viz. the *interrupted screw* system—though two distinct forms of screw are used. The rear part of all guns is strengthened by shrinking on to the A tube a breech-piece or jacket. When the heavy B.L. guns were introduced, the large charges employed were found to produce a rapid scoring of the bore; and to meet this, 'liners,' or thin tubes of specially well forged steel, were inserted in the A tube. Breech-rings round the extreme rear of the gun, thrust-collars round the jacket, and longitudinal feathers near the centre of gravity of the piece, are necessary adjuncts to recoil cradles, while the bulk of guns are provided with trunnions.

The steel used in the manufacture of modern guns is made exclusively by the open-hearth process, and the ingots are cast solid. The first operation is *forging*. If the diameter exceeds eight inches, a hole must be bored or trepanned through the ingot, and mandrils used in the hole during the subsequent forging operations. A block of steel is heated in a furnace, and then by means of steam hammers or hydraulic presses is hammered or pressed down to the required shape. Particular care has to be taken that the steel is not overheated, nor should it be drawn out too much at any one operation. If the casting is intended for a long tube (such as the A tube), it is alternately heated and forged out by degrees into a cylindrical shape of a diameter of from one to one and a half inches above that required for the finished tube.

After forging, the metal is *annealed* by slow heating and cooling, so as to get rid of strains set up by the hammer or press. The forging is now ready for rough-turning the outside and rough-boring the tube in an ordinary lathe. Where the forging is solid, the centre may be removed by *trepanning*, or cutting out a central ring of metal.

The next stage is *oil-hardening*, which consists in heating the steel to a high temperature in a gas furnace, and plunging it while hot into a bath of rape oil kept cool by a water-bath round it. With the object of reducing possible internal strains in large masses of metal, the steel is reheated to about 900° F., and allowed to cool slowly.

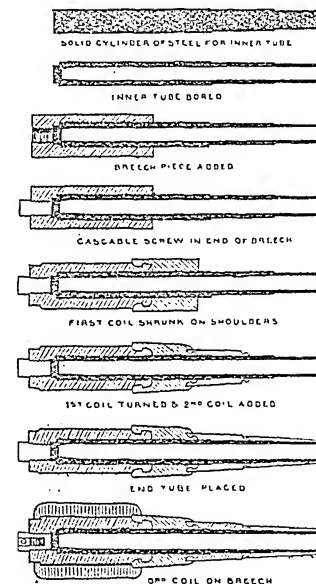
When all the parts of the gun have been completed as far as the second boring and turning, they are ready for the operations of building up together by successively heating and shrinking on. The outer coil or tube is expanded by heat (about 600° F.) until sufficiently large to fit easily over the part on which it has to grip. When raised to a blue heat, the coil is lifted from the fire by a crane, and, the inside being thoroughly cleaned, it is lowered over the part of the barrel or gun (set vertically in a pit) which has been prepared to receive it. When cooling, great care is required to prevent a long tube from taking a grip at both ends while the middle remains in expansion. Water is generally applied to the part where first contact is wanted, and gas jets are often arranged in rings round the rest of the tube in such a way that they can be put out as the process of cooling goes on. The inside of the gun is always kept cool, to hasten the work and promote regular contraction, commencing from the inside of the coil. Where the parts are provided with locking joints to secure longitudinal strength, the outer parts while hot are turned sufficiently to interlock, and any screwed hoops or rings are usually screwed on hot. After the gun is built up, it is again placed in a lathe and finish-turned inside and out.

Next comes *broaching*, or very fine boring; while, in order still further to improve its surface, the bore is *lapped* with lead and emery. The grooves of the rifling are now cut in a special lathe, and the breech prepared to receive its fittings. The axial vent, breech-screw, etc., are made of steel forgings, and oil-hardened, finish-turned, screw-threaded, etc. Complete gutta-percha impressions are now taken of the bore, which is very accurately gauged to thousandths of an inch, both horizontally and vertically.

After several proof rounds giving 25 per cent. higher pressure than the service charge, the gun is again examined, and, if passed, finally finished off.

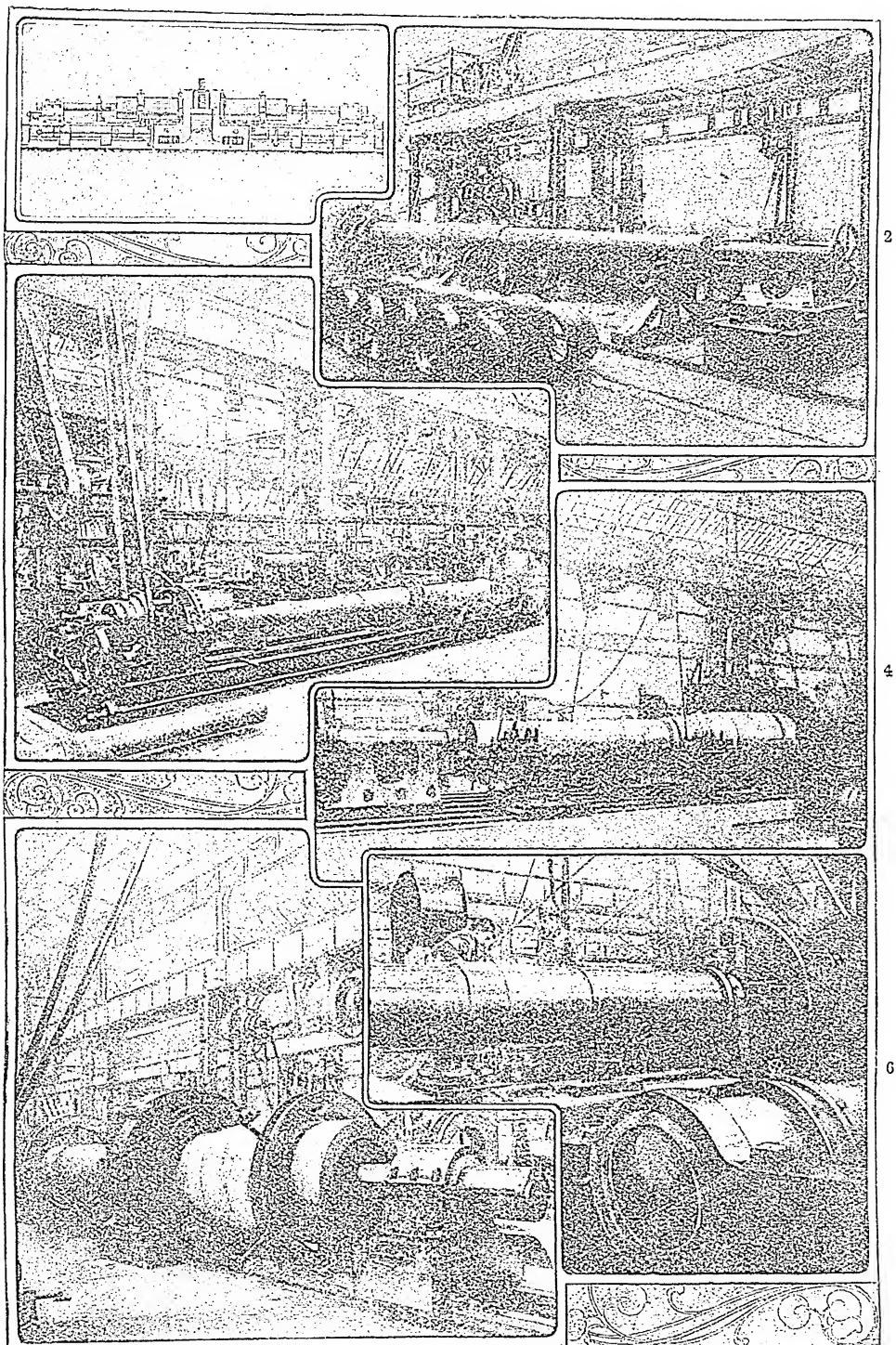
In the *wire system* of construction, steel wire is coiled on to a tube with a tension regulated by a simple adjustment of weight, so as to give with absolute cer-

tainty the exact state of initial stress desired. The wire used is of rectangular section, '06 inch in thickness and '25 inch in width. The advantages of the wire system of construction may be summed up as follows:—(1.) Absolute soundness of the material employed, whereas no possible system of testing or care in manufacture can in all cases ensure this result when forged steel hoops are used. (2.) The required initial tension can be regulated with the utmost nicety, while with forged hoops no such accuracy of effect can be attained. (3.) Steel in the form of wire or ribbon possesses double the tensile strength of the same metal in the form of forged



Building up an 80-ton Gun.

hoops or tubes. For the same weight of gun, a stronger gun with better ballistic effects can be produced. On the other hand, wire construction of ordnance presents considerable difficulties. The wire coil has no longitudinal strength, its function being solely to resist the bursting or circumferential strain. Several plans have been tried, such as brazing, employing wire of a double-cone section, coiling the wire on the tube at a considerable angle, and connecting the breech block to the trunnion rings by steel rods. But the general system now employed is to gear the breech-screw into a bush, which is screwed in most modern guns, such as the 9'2 inch B.L., to the A tube; and in other guns, such as 12-pounder of 6 cwt., to



Gun Manufacture.

1. Boring machine for guns up to 12 in., boring from both ends. 2. Wire-winding machine. 3. Lathe carrying a gun being turned ready to receive its outer hoop. 4. Lathe turning the jacket of a 12-in. gun. 5. Boring machine for jackets and large hoops, driven by motor. 6. Wire-coiling a big gun at Woolwich Arsenal. (Photo by Gregory.)

the jacket; or, as in the 4·7 inch Q.F. gun, partly to the jacket and partly to the A tube. From the part of the gun to which the bush is connected to the A tube at the front end, a series of outer tubes, connected by hook joints, are accurately fitted on overlying steel wire, and giving the necessary longitudinal strength. For the long modern guns the tendency to droop at the muzzle has to be combated, and in respect of this the wire construction gives no aid. The following table affords a comparison between a wire gun and a modern all-steel gun (without wire) of the same calibre:—

Nature.	Weight.	Length.	Length in Calibres.	Chamber Capacity.	Cordite.	Weight of Projectile.	Muzzle Velocity.	Penetration in Wrought Iron.
12" VII. (steel)	46	328·5	25·25	9,666	Lbs. 88½	715	1,914	24·05
12" VIII. (wire)	46	445·5	35·4	13,403	167	850	2,367	37·63
9·2" VII. (steel)	22	310	31·5	4,950	50½	380	2,065	23·41
9·2" IX. (wire)	27	445·25	46·74	8,100	100	380	2,601	33·09

Wire guns may be divided into two classes: (1) B.L. guns from 6 inch calibre upwards, in which a second inner A tube is employed; (2) all the lighter kinds of B.L. guns, and all Q.F. guns of wire construction in which the A tube forms the surface of the bore. The method of winding on the wire and fastening it off is practically the same in all guns, and the process of construction is as follows:—The portions of the gun under the wire are first built up in the ordinary way. Before commencing to wind on the wire, certain points along the length of the gun are selected, at which a series of layers are to commence and terminate; and at these points a steel band or wire ring is lightly shrunk on the A tube. The length of each band of wire is 400 yards. The end of the wire is bent round nearly at right angles, and inserted in a slot at the side of a wire ring. A hole is bored through the band and into the slot, at the bottom of which a cup-shaped recess is formed. The upper part of the hole is fitted with a screw thread, and into this is screwed a steel plug, the lower end of which pinches the wire ribbon into the cup-shaped recess, and thus makes an efficient fastening. In fastening off, the same arrangement is effected with the aid of a clamp placed over the wire on the gun, to prevent the tension becoming relaxed. Winding is always started from the muzzle end.

The apparatus for regulating the tension of the wire is secured to the saddle of a lathe in which the gun revolves, and the saddle is 'traversed' backwards and forwards along the gun at a suitable rate by means of an endless screw. The wire, wound on a large reel, is led to the gun through a pair of smooth hardened steel blocks or dies. These dies are enclosed in a gun-metal box, through which water circulates for the purpose of keeping the dies and wire cool. As the gun revolves outwards, the wire is drawn through the apparatus and wound on the gun; the necessary tension is obtained by forc-

ing the upper steel block towards the lower one. The pressure is regulated by a weight on a lever, which controls a knuckle-joint that straightens or bends according to the effect required. When it is necessary to splice on a new piece of wire, the ends of the two pieces to be joined are scarfed down and overlapped for a length of twelve inches, partially soldered, and secured by thirty-two equidistant rivets. Roughly speaking, the winding tension will vary from about thirty-five to fifty-six tons on the square inch at the commencement, to from twenty to forty on finishing off. As the winding proceeds, the tensions of the interior layers become gradually relieved by the tension of the wires above them. Hence it is necessary to begin winding at a high tension, and gradually lessen until the last layer is finished off at exactly the tension required for the outer coil of the gun at rest. Some guns are strengthened with wire only as far as a little in front of the chamber, while in others the wire extends over the A tube to half-way up the chase, and in some cases nearly up to the muzzle.

The winding having been completed, the exterior of the gun is cleaned and gauged, preparatory to the further building up. The outside hoops, with the necessary interlocking arrangements, are put over from the muzzle, being heated so as to enable them to pass over easily and to get a close mechanical fit. They are

not, however, *shrunk* over in the usual sense of the term. After building up according to the design, the exterior, chamber, and bore are finished off, and the latter is rifled. The breech is now prepared to receive its fittings, and the gun, being completed, goes through stages of inspection and minor operations similar to those in the case of an ordinary all-steel gun.

The larger B.L. guns of wire construction are fitted with an inner A tube, or *liner*—that is, a thin tube made of specially well forged steel. Liners are very accurately gauged, and are gradually hammered or pressed home from the breech end to the muzzle of the bore, and then secured at the rear end by a screwed steel collar. To prevent any chance of twisting, the exterior of the liners are at points roughened, and fit into serrations on the interior surface of the A tube. Most modern ordnance, with the exception of 'siege' and light quick-firing guns, are now constructed on the wire system.

Gun-metal, an alloy of copper with from nine to eighteen per cent. of tin, together with small quantities of lead and zinc. It is a tough, reddish metal that requires to be cast carefully, so that its constituents and their compounds may not separate, and was formerly used for casting ordnance, but is now chiefly employed for making castings for bearings, taps, and other engineering purposes.

Gunnel, a name sometimes given to the fish *Centronotus gunnellus*; also called butter-fish.

Gunner, NAVAL, in the British navy, is an executive (warrant) officer, on a par with the boatswain and carpenter. A gunner's duties are concerned with guns, small-arms, and everything connected with them. Under his charge fall the magazines, shell-rooms, gun-sights, ammunition, powder, pistols. A man becomes a gunner by serving at sea until he is a leading seaman, an able seaman, or a petty officer. He may eventually become captain of a gun, or leading torpedoman, or gunnery instructor; and if, in addition, he be a first-class gun and rifle shot, he may become captain of a turret or barbette. A chief gunner is a commissioned officer, and becomes so by selection by the Admiralty from among the ranks of gunners. See WARRANT OFFICER.

Gunnery, or BALLISTICS, is that portion of artillery science which deals with the flight of projectiles, and the means whereby accurate shooting from a firearm can be attained. 'Interior bal-

istics' is the study of the pressure in the bore of a gun caused by the gases of the explosive which give initial velocity to the projectile. 'Exterior ballistics' is the theory of the flight of a missile travelling at high velocity, and acted on by the force of gravity and the resistance of the air. For comparatively slow motions, the retardation caused by the air varies with the square of the velocity; but with the ogival rotating projectile of a modern gun, so many other considerations come into play that the conditions of flight are mainly determined by experiment. A missile is now fired through equidistant electric screens, and the time of flight between their severed wires noted by a chronograph. By formulæ used in conjunction with experimental ballistic tables, the trajectory or path of any shot at a given velocity can be demonstrated. When once the ranges are found, the sights of the gun or the rifle are adjusted for each distance, and their manipulation becomes a matter of mere drill. In fitting a sight, allowance has to be made for the derivation or drift of a projectile due to its rotation. See Inglis's *Ballistic Tables* (1894); Metcalfe's *Ordnance and Gunnery* (1891); Russell's *Practical Gunnery* (1903); Bruff's *Textbook of Ordnance and Gunnery* (1896); and *Treatise on Ordnance Service* (5th ed. 1901).

Gunnery Schools. NAVAL.—In Britain the chief naval-training establishment for gunnery, which was long identified with the *Excellent*, has for some years been carried on ashore at Whale Island, Portsmouth. The training in gunnery for an officer is divided into two branches. The theoretical course is gone through at Greenwich for nine months. The practical course is gone through at Whale Is., and occupies five months and three weeks. A further period of five weeks is spent at Woolwich, in the royal gun factory, carriage department, and laboratory. One year's service as lieutenant at sea is necessary before going to Whale Island. The *Cambridge*, at Devonport, is a similar institution to the *Excellent*, though at Devonport the school still has its headquarters afloat, and officers may go through a gunnery course there and qualify in the same way. See EXCELLENT, CAMBRIDGE.

MILITARY.—The establishment at Shoeburyness, Essex, affords instruction in gunnery science to officers and men of the Royal Artillery, and in certain courses to officers of militia and volunteer artillery. The school carries out all experiments in gunnery for the Ordnance Committee. The

annual meeting of the National Artillery Association is held at Shoeburyness each September.

Gunning, ELIZABETH, DUCHESS OF HAMILTON AND OF ARGYLL (1734-90), born in Roscommon co., Ireland, daughter of John Gunning of Castle-Coote; made a romantic secret marriage in Mayfair (1752), at midnight, with James, Duke of Hamilton, who died in 1758; and in the following year she married John Campbell, Marquis of Lorne, who succeeded to the dukedom of Argyll in 1770. She was of extraordinary beauty. She was created Baroness Hamilton of Hambleton (1776) in her own right.

Gunning, MARIA, COUNTESS OF COVENTRY (1733-60), elder sister of Elizabeth Gunning; born in Roscommon co., Ireland; was married in 1752 to George William, Earl of Coventry. Almost surpassing her sister in beauty, she stood high in the royal favour, in spite of her extreme vanity and foolishness.

Gunning, SUSANNAH, née SUSANNAH MINIFIE (1740-1800), novelist, was married in 1768 to John Gunning of Castle-Coote, Co. Roscommon, Ireland, the brother of Maria and Elizabeth Gunning. Her novels, which enjoyed popularity in their time, but are devoid of any force, include *Barford Abbey* (1768), *The Count de Poland* (1780), *Memoirs of Mary* (1793), *Fashionable Involvements* (1800), and *The Heir Apparent* (1802).

Gunnison, riv., U.S.A., rises in the Sawatch Mts. in Colorado, and flows W. and N.W. through several cañons (one 2,500 ft. deep) to its junction with the Grand, one of the two main forks of the Colorado. Its length is 200 m., and its drainage area 7,935 sq. m.

Gunny-bags. See JUTE-BAGS.

Gunpowder. The early history of gunpowder is very obscure, but what evidence there is seems to point to China as its birthplace. It was probably first used in Europe as a propellant by the Moors in the 12th century, its mixture was described by Roger Bacon in the 13th, and it was used in warfare by the English in the 14th (at Crécy). Ordinary black powder consists of saltpetre, charcoal, and sulphur in the proportion of 75, 15, and 10; but slow-burning prismatic powders contain different proportions—*e.g.* prism brown and S.B.C., 79 saltpetre, 18 charcoal, 3 sulphur. The saltpetre, or nitre and sulphur, are carefully purified before being used. The function of the former is to supply the oxygen necessary for combustion, whilst the sulphur, besides being combustible also, lowers the temperature of ignition. Charcoal is obtained by

the 'destructive distillation' of wood or vegetable matter—dogwood, alder, and willow being the best woods for the purpose; whilst for some of the brown powders carefully-selected straw is used instead of wood. The nature of the wood and the temperature at which it is charred exercise great influence on the powder produced; otherwise its character depends largely on the following properties:—(1) Size and shape of grains greatly affect the rate and regularity of combustion of the powder. With the slow-burning brown powders, sometimes known as 'moulded' or 'prism' powders, and generally used as propellants in heavy guns, the powder is made in small hexagonal prisms, about one and a quarter inches in diameter and one inch high, with one or more perforations through the centre of each prism. (2) Density and hardness, (3) glazing, and (4) moisture all tend to reduce the rate of combustion of the powder.

The processes of manufacture may be briefly summarized as follows:—(1.) Incorporating or milling. In this process the charge is crushed and still further mixed in a machine fitted with a combination of rolling and twisting rollers. (2.) Breaking down the mill-cake, which is reduced to meal in another roller machine. (3.) Pressing. The meal is placed in a press-box and compressed to a uniform density. (4.) Granulating. This is the process by which the powder-cake is broken up, or reduced to grain, by passing it under a series of rollers. (5.) Dusting. The powder is freed from 'dust' by passing it through dusting reels or sieves. (6.) Glazing. Glaze is now imparted to the powder by placing it in large revolving barrels. (7.) 'Storing' or drying in a stove or drying-room fitted with hot-water pipes. The amount of moisture left depends on the nature of the powder. (8.) Finishing. This is a final dusting process. Where grains of extra large size are required, the powder is compressed in moulds.

Good gunpowder is of dark slate colour, or in the case of the 'cocoa' powders is dark brown instead of black, owing to the partial charring of the charcoal employed. Gunpowder should not be easily crushed or very hygroscopic, and the grains should be of uniform size. It can be set on fire by a blow between hard materials, or by contact with hot or burning bodies at a temperature of about 300° C. When ignited in the open air, small quantities simply burn, but large quantities explode in the same manner as when in a confined space, the products being

partly solid and partly gaseous. The gases formed occupy about three hundred times the volume of the gunpowder at standard temperature and pressure, though at the high temperature of the explosion a greatly increased volume is produced. See Cundill and Thomson's *Dictionary of Explosives*; Bernadon's *Smokeless Powder* (1901), and *Treatise on Ammunition* (1897); and Hime's *Gunpowder and Ammunition* (1904).

Gunpowder Factory, BRITISH, is at Waltham Abbey in Essex, where most of the ammunition for the army and navy is manufactured.

Gunpowder Plot, a conspiracy to blow up the Houses of Parlia-

with the troops sent to arrest them. In recent years an attempt has been made by Roman Catholic historians to prove that there never was any plot, but criticism seems to have established the soundness of the popular version. See S. R. Gardiner's *What the Gunpowder Plot was* (1897).

The plot is commemorated in the annual searching of the vaults below the Houses of Parliament at the opening of the session; by boys in their November 5 processions carrying a scarecrow figure, representing Guy Fawkes with a dark lantern and matches, which is finally burned in a great bonfire. In the old English Prayer-book there was a special form of prayer for November 5 called

be found and given to the guns by the methods which would be available in war time. One ship is to mark for the other, and only actual hits are to be counted.

Gunroom, the mess to which the junior officers of a ship belong—i.e. the sub-lieutenants, midshipmen, cadets, and officers who do not belong either to the wardroom mess or to the warrant officers' mess. Until the middle of the 18th century the distinction between gunroom and wardroom was unknown.

Guns. (1.) SPORTING GUNS. In the earliest form of hand-gun the explosive was fired by a match, applied by hand to a touch-hole in the breech end of



The Gunpowder Plot: the Conspirators.
(From an old print.)

ment on Nov. 5, 1605, when the king was present to open Parliament in person. A number of Roman Catholic country gentlemen seem to have been connected with it; but the ruling spirit was Robert Catesby. The success of the conspiracy was to have been followed by a rising in the midlands. Tresham, who was to have taken part in the rising, wrote a letter on October 26 to his friend Lord Monteagle, whom he wished to save from the general destruction. This led to the discovery of the plot. Guy Fawkes, one of the conspirators, was arrested at his post in the cellar. Catesby fled to the country to bring about the general rising; but in a few days he and many of the others fell in conflict

with the troops sent to arrest them. In recent years an attempt has been made by Roman Catholic historians to prove that there never was any plot, but criticism seems to have established the soundness of the popular version. See S. R. Gardiner's *What the Gunpowder Plot was* (1897).

Gun Practice, NAVAL. Firing is done at sea as much as possible, and targets, generally floating ones, are used. The special regulations are these: 'A target 50 ft. long by 25 ft. high, and having a mast 35 ft. high, is to be laid out. At this each ship is to make two runs on a straight course, opening fire at 6,000 yards from the target. One run is to be made for each broadside. The ship is to steam at 12 knots, and firing is to be continued for four minutes during each run. All heavy guns that will bear are to fire on each run, but not the light quick-firing and machine guns. The firing basis is not to be marked by buoys, and the distances of the targets are to

the tube. The matchlock was followed by the wheel-lock, which introduced the flint and steel principle, and was the forerunner of the flintlock proper. This consisted of a hammer ('serpentine,' 'cock,' 'dog'), which held the flint in its jaws and was actuated by a spring, so that on being released the flint was brought sharply down on the steel in the flash-pan; the spark thus caused ignited the priming, and eventually brought about the explosion. The Brown Bess, the British military arm, was of this type, and was only superseded by the Brunswick rifle, a detonator, as late as 1835.

The guns made by Joe Manton in the early part of the 19th century may be regarded as the

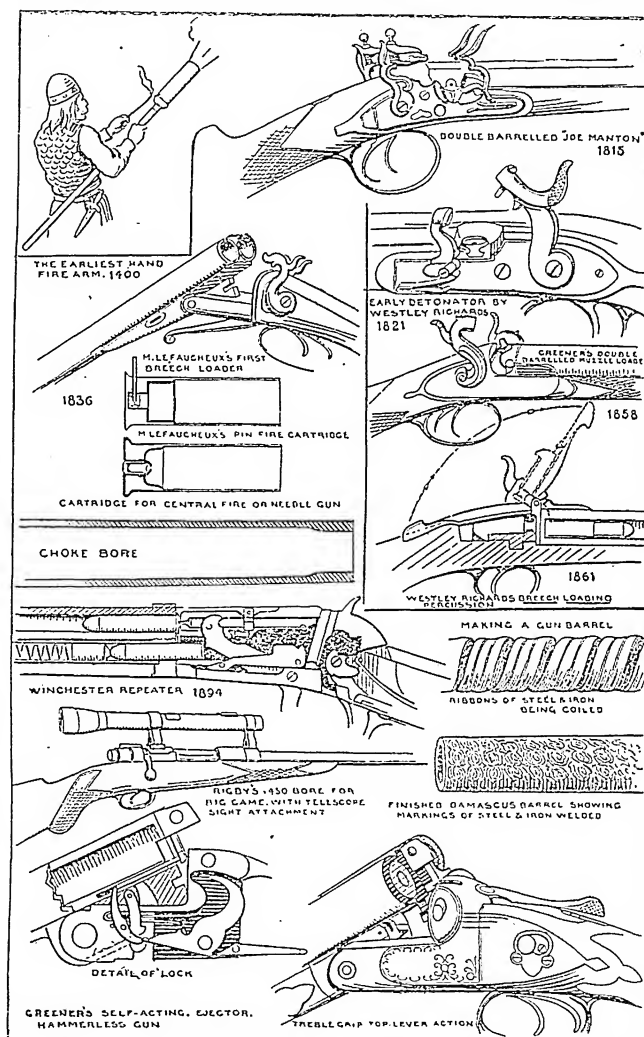
earliest type of practically designed sporting firearms. The typical Joe Manton game gun was a double-barrelled muzzle-loader, the firing mechanism being a perfected form of flint-lock; though towards the end of his career he adopted the detonating system. In his detonating gun, a thin metal cap containing a fulminate was placed on a hollow nipple communicating with the chamber which contained the explosive, and was fired by a sharp blow from the hammer. Attempts had been made as early as the 17th century to make a breech-loading gun, but Lefauchaux, a French maker, was the first to give practical shape to the idea, when, in 1836, he introduced his pinfire breech-loader. Its success was mainly due to his cartridge, which contained the charge, and also the cap and exploding pin. On explosion the base of the cartridge expanded, making the breech gas-tight, and thus the first great difficulty in making guns on this principle was overcome. The central-fire gun and cartridge came next. The latter, invented by Pottet, a Frenchman, was introduced into England in 1861 by Daw, in connection with his central-fire gun (an improvement on Lancaster's gun of some ten years previously). This cartridge was almost identical with that in use nowadays.

In the breech-loader the method of connecting the barrels to the body of the gun is a most important matter. The 'drop-down,' or hinged joint, and 'Purdey snap action,' are now in universal use, in variously modified forms, the most general being the 'top lever' gun. In this, two bolts in the body of the gun are forced by a spring into slots cut in steel lumps under the breech end of the barrels; to open the breech, the bolts are withdrawn by a lever pivoted on the standing breech, and lying along the tang of the break-off. A projection or extended rib, fitting into a slot in the standing breech, is sometimes added; if this is also bolted, as in the Greener and Westley Richards patterns, it constitutes the treble grip action, which, though it undoubtedly adds rigidity to the connection, is not generally thought necessary in game guns of the best quality.

Hammerless guns—i.e. guns in which the hammers or strikers are fitted on the inside of the lock-plates, or within the breech action—are the latest development of the central-fire system; and when such a weapon is fitted with ejectors—i.e. a mechanism for ejecting the fired cartridge cases—it may be regarded as the most

perfect form of sporting gun. The mechanisms employed by the gun-makers of the present day may be generally divided into two groups—(1) guns which are cocked by the leverage of the barrels when opening the breech, developments of the Needham (1874) and Anson and Deeley (1875)

the gun is cocked automatically by a master limb of the mainspring that is released on opening the breech, and thrown out of action when compressed in closing it. The credit of introducing the ejector belongs to Mr. Needham (1874). The single trigger—i.e. one trigger only, which fires both



Types of Sporting Guns, Old and New.

mechanism, now illustrated respectively in the Greener and Westley-Richards types of gun, and, in more modified form, in the side-lock actions employed by a large majority of gun-makers; and (2) guns cocked by other means, the best examples of which are the Purdey and Lancaster actions, in both of which

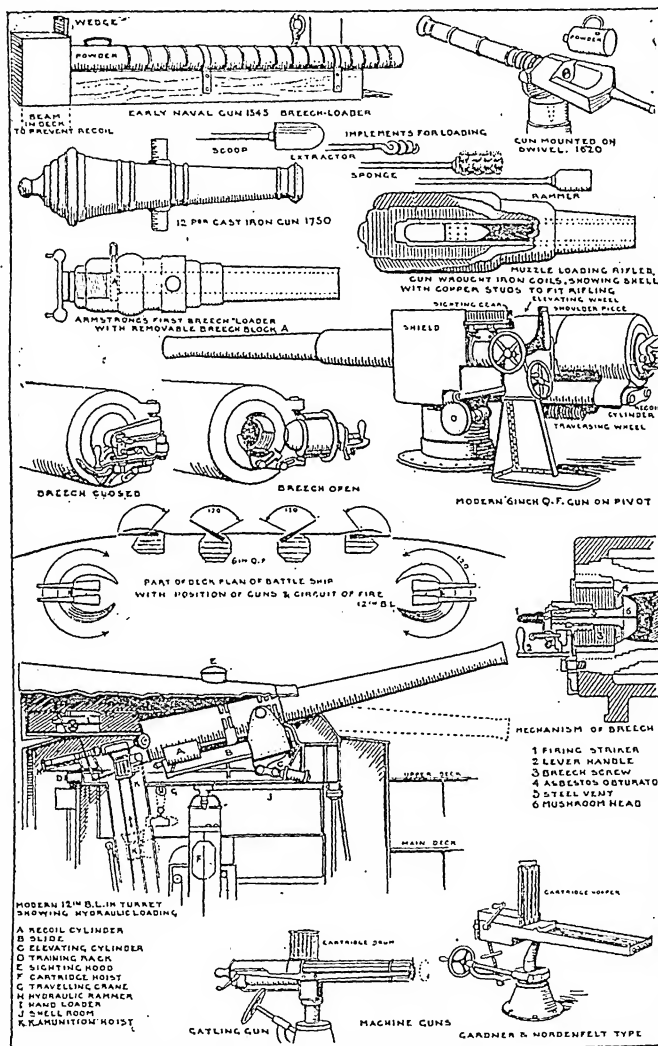
locks—is the latest contrivance. The weight of a best game gun is, as a rule, from 6½ to 6¾ lbs., and its price about £80; in some cases, for specially fine work, it may cost as much as £90. But a sound hammerless gun may be purchased for about £20, or even less; for £25 an ejector gun of the same quality may be bought.

Four-bore single-barrelled and 8 and 10 bore double-barrelled guns are used for wild-fowl shooting, though the 10-bore is nowadays rarely met with, because a specially bored heavy 12-bore has been found to be as effective, and it is handier. The 16-bore game gun, once so popular, is

refer to the number of such discs which go to the ounce. Thus, '12-bore' means that it would take twelve discs of the size accurately fitting such a barrel to weigh 1 oz.; similarly, four discs fitting a '4-bore' barrel would weigh the same, the gauge being so much larger.

and address are stamped on a gun wholly or in greater part made by some manufacturer of the 'black country.' The few genuine makers of the metropolis do all their skilled work—such as boring, filing, jointing, finishing, etc.—in London, and maintain the same high quality and peculiar merit which have always distinguished their masterpieces.

The mechanism (action, locks, etc.) of sporting rifles is in high-grade weapons similar to that employed in fowling-pieces. In single-barrelled rifles some modification of the falling block (Martini) or sliding block (Westley-Richards) is common; while in cheaper grades and small-bores, military single-shot or magazine patterns, such as the Lee Speed, Mannlicher, Mauser, Ross, etc., are the most popular. The rifling consists of four, five (Enfield), or more shallow grooves, cut spirally in the inside of the barrel, the twist of the spiral making a complete turn in ten inches (Enfield) approximately. The shallowness of the grooving reaches the extreme in 'ball and shot' guns, where it is scarcely perceptible, the number of grooves reaching its minimum in Lancaster's oval-bore rifle of this pattern. The essential qualities of a sporting rifle are low trajectory, accuracy at sporting ranges (200 to 300 yards), high velocity, which in the case of a suitable bullet ensures good penetration and force of impact or stopping power, combined with handiness. The value of small-bores (such as '303') in dealing with very dangerous game—such as elephant, rhinoceros, buffalo, lion, etc.—is a point about which there has been much controversy. The needs of most hunters in the big-game countries would now be supplied by a '303' double-barrelled 'express' or sporting magazine rifle (with soft-nosed, Tweedie, or hollow pointed bullets), supplemented by a ball and shot gun 12 or 10 bore, combining in one weapon a strong shooting fowling-piece (but a little heavier than the ordinary pattern), and a powerful express rifle capable of stopping an elephant or buffalo as effectively as the much heavier rifles of older pattern made specially for this work. As an extra weapon with dangerous game the modern hunter would probably choose a '450' or '500' cordite high-velocity rifle. An old-fashioned battery for the same purpose would probably consist of a 10, 8, or even 4 bore elephant gun, a '577' or '500' express rifle as a second weapon when hunting rhinoceros or buffalo, a '450' or '400' express as a general rifle for the larger antelopes, leopards,

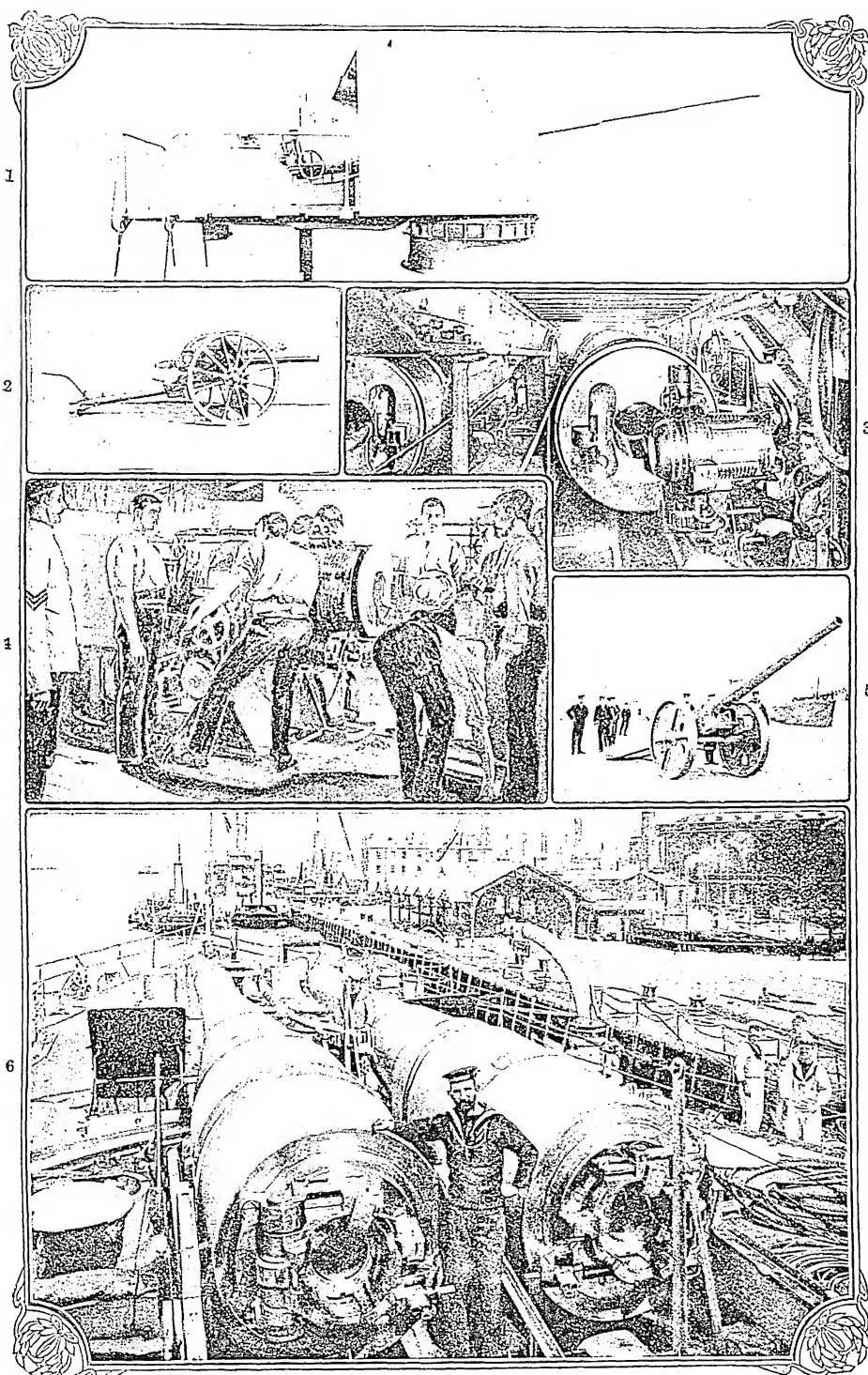


Types of Naval Guns, Old and New.

now very seldom made. The 20-bore has many advocates, and makes a very pretty weapon for ladies' use.

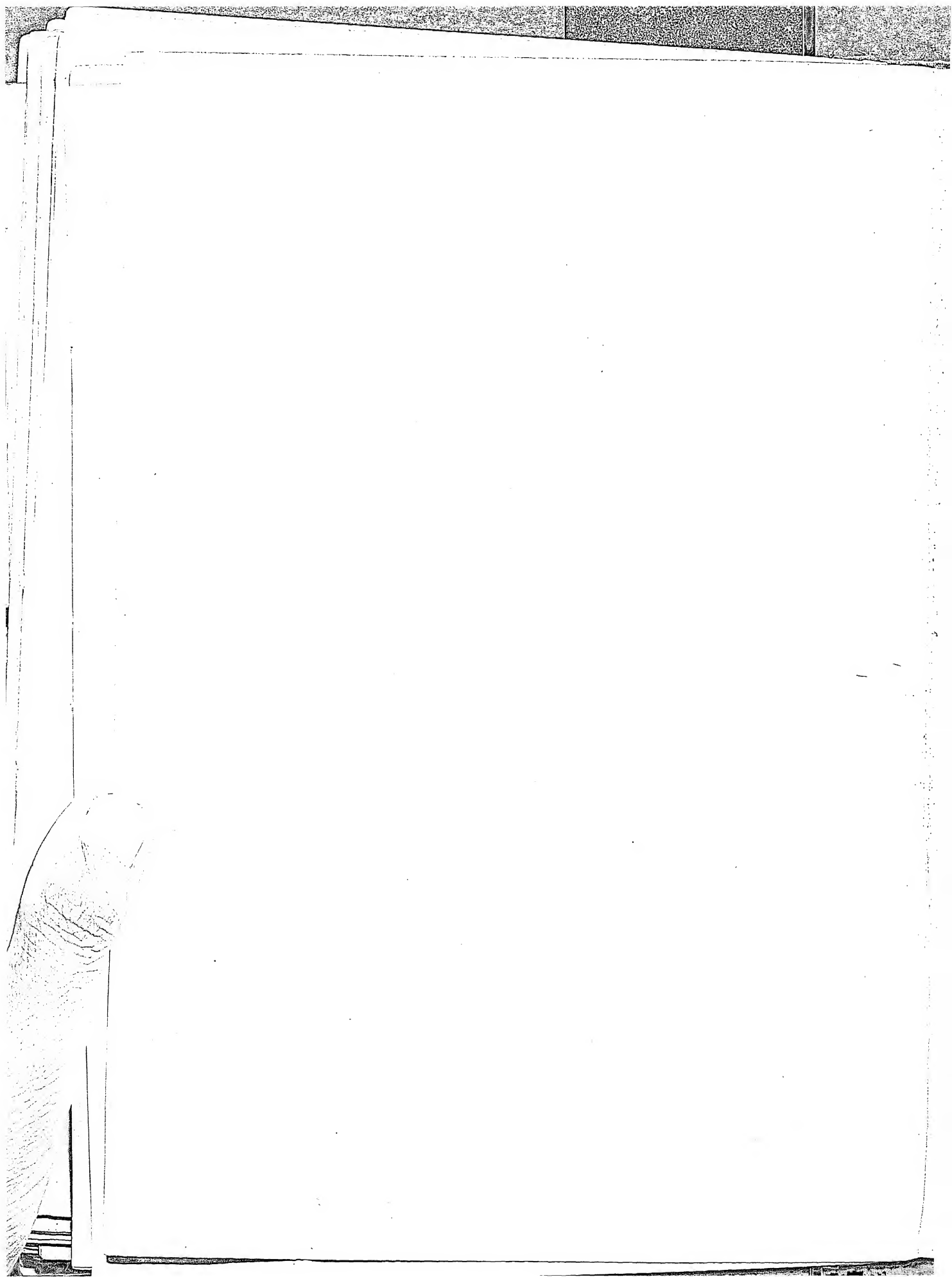
The standard by which the gauge or internal diameter of gun barrels is measured is determined by the weight of circular discs of different sizes but uniform thickness. The numbers

London, whose gunsmiths have always been famed for the excellence of their work, has now, industrially speaking, yielded place to Birmingham as the centre of the British gunmaking trade. Indeed, except in the case of a few of the best London makers, the so-called London gun trade is carried on by dealers, whose name



Some of our Modern Guns.

1. The 32-in gun (Armstrong, Whitworth & Co.) 2. The new 15-pr. field gun of the Royal Artillery. (Photo by Sturdee.) 3. Interior of the barbette of H.M.S. *Majestic*, with two 12-in. 46-ton guns. (Photo by Thiele.) 4. Gun's crew working 6-in. gun at sea. (Photo by Gale & Polden.) 5. A 47 gun on Captain Scott's carriage, as used at Ladysmith and Modder River. (Photo by Cribb.) 6. Fore barbette of H.M.S. *Royal Sovereign*: two 13.5-in. 67-ton guns. (Photo by Gale & Polden.)



etc., perhaps a '360 express as a light rifle for the smaller varieties of deer, and a 12-bore fowling-piece.

The rifles used for deer stalking or driving in Britain are usually '400 or '360 express, or the smaller bores, such as the Enfield or Mämlücher ('303 and '256 respectively). For rook and rabbit shooting the usual bores range from as small as '22, a very efficient little weapon in the hands of an expert shot, to '380 with the short cartridge. Perhaps the best bore for such sport is the '300 or '295, which combines the necessary stopping power and short range. See *The Gun and its Development*, by W. W. Greener (7th ed. 1899), undoubtedly the book of the gun; also his *The Breechloader, and how to use it* (8th ed. 1899); *The Modern Sportsman's Gun and Rifle*, by J. H. Walsh (1882-4); *Shooting, its Appliances, Practice, and Purpose*, by T. D. Dougall (1895); and W. O. Greener's *Bibliography of Guns and Shooting* (1896). See also, in the Badminton Library, *Shooting*, vol. i.; and Payne-Gallway's *Letters to Young Shooters*, 1st series (5th ed. 1899).

(2.) NAVAL GUNS.—The earliest cannon used at sea were probably introduced in 1346, and were made of hooped iron bars, had a very small bore, and were intended for firing stone balls. But it was not until about two centuries afterwards that cannon became of much practical use. The invention of port-holes, attributed to Descharges of Brest, about the year 1500, enabled several guns to be carried; and the first large English ship to have them was the *Henry Grace à Dieu*, which probably carried twenty-one heavy guns, besides many small ones. In 1612 the number of guns carried by the royal or great ships was sixty-four at the outside, so that little progress had been made in the hundred years since 1514. The naval guns most commonly used in the reigns of Elizabeth, James I., and Charles I. are given in Table I.

The smaller pieces merged almost insensibly into the swivels and arquebuses *à croc* of the period. One of the reforms of the commonwealth was greatly to reduce the number of types of ordnance in use in the navy; and another was generally to substitute brass for iron guns, though certain guns had been made of brass at a much earlier date. In 1677 the first approach to a regular establishment of guns for ships of various classes was decided upon as shown in Table II.

In the great days of the British navy—the days of Hood and Nelson—the guns usually carried by

ships of the line were rarely larger than 32-pounders. The effective range was hardly more than 2,000 yards, and even then accuracy was not assured. Table III. shows the nature of the armament of 110-gun and 74-gun ships. It is true that 42-pounder and 68-pounder carronades were in use during the latter part of the period, but they were only short-range weapons. (See CARRONADE.) In the first quarter of the 19th

armour at 800 yards with an elongated projectile. The introduction of rifling for small-arms caused the same principles to be applied to great guns. Whitworth's gun had the bore cut hexagonally, and twisted. The gun of Lancaster of about the same time was oval-bored. The tendency of all experiments was to reduce windage—i.e. to make the projectile fit the bore more closely. It was in 1858 that

TABLE I.

Name.	Calibre.	Weight of Gun.	Weight of Shot.	Weight of Powder.	Extreme Range.
	Inches.	Lbs.	Lbs.	Lbs.	Paces.
Cannon royal.....	8·5	7,000	66	30	1,930
Cannon.....	8	6,000	60	27	2,000
Cannon serpentine.....	7·5	5,500	53·3	25	2,000
Bastard cannon.....	7	4,500	41·25	20	1,800
Demi-cannon.....	6·5	4,000	30·25	18	1,700
Cannon pedro.....	6	3,000	24·25	14	1,600
Culverin.....	5·5	4,500	17·3	12	2,500
Basilisk.....	5	4,000	15·25	10	..
Demi-culverin.....	4·5	3,400	9·3	8	2,500
Bastard culverin.....	4	3,000	7	6·25	1,800
Saker.....	3·5	1,400	5·3	5·3	1,700
Minion.....	3·25	1,000	4	4	1,600
Falcon of 2½ inch.....	2·33	800	3	3	1,500
Falcon.....	2·5	600	2·25	2·25	1,500
Falconet.....	2	500	1·25	1·25	1,400
Serpentine.....	1·5	400	·3	·3	1,300
Robinet.....	1	300	·5	·5	1,000

TABLE II.

	42-prs.	32-prs.	18-prs.	12-prs.	Sakers.	3-prs.	Total.
First rates....	26	..	23	..	44	2	100
Second rates..	..	26	26	..	36	2	90
Third rates...	..	26	..	26	14	4	70

TABLE III.

	No. of Guns.	Type and Weight of Shot.	Calibre.	Weight of Gun.
			Inches.	Cwt.
Ships of 110 guns.....	30	32-prs.	6·41	55½
	30	24 "	5·823	50½
	32	18 "	5·292	43
	14	12 "	4·623	29½
	4	12 "	4·623	32
Ships of 74 guns.....	28	32-prs.	6·41	55½
	28	18 "	5·292	43
	14	18 "	5·292	38
	4	18 "	5·292	63

century the discarded 42-pounder was revived as an 84-cwt. gun; and soon afterwards even heavier weapons began to be constructed. In 1842 a 68-pounder of 112 cwt. was experimented with, and was subsequently adopted, though the usual 68-pounder was for many years one of 95 cwt. only. A little later Armstrong made a 400-pounder smooth-bore, which penetrated 4½ inches of iron backed by 18 inches of teak; and Whitworth made a 120-pounder that penetrated 4½ inches of

Armstrong made the first breech-loading big gun in England. But the earliest British breech-loaders proved unsatisfactory, and the British navy did not finally adopt a better breech-loading system until about 1880. In the interval rifled muzzle-loaders of great size were produced upon Armstrong's built-up system, the largest being the 80-ton 16-inch gun known as the 'Woolwich infant,' and an Italian 100-ton gun. The earliest Armstrong breech-loaders were known as screw guns. The barrel

of a gun of this type was a built-up tube, with both ends open. Near the rear end of the gun a slot was cut; into this slot a wedgelike breech block was dropped; and this block, when in position, was

a much more satisfactory breech-loading arrangement. In this the breech-block rests in a frame, which is hinged to the rear end of the gun, and can be pushed partially through the frame into

breech, and so hold the block fast. When retracted, the breech block can be swung aside in its frame, and thus the orifice of the chamber is laid completely open for cleaning and loading.

TABLE IV.—Heavy Guns of leading Naval Powers.

	GUN.			PROJECTILE.		BALLISTICS.		
	Calibre or Pounder.	Weight of Gun.	Length of Bore in Calibres.	Diameter in Inches.	Weight.	Muzzle Velocity, Feet per Second.	Muzzle Energy, Foot-tons.	Perforation of Wrought Iron at Muzzle.
Great Britain, B. L. Guns (Woolwich-Armstrong type).	16.25 in.	Tons cwt. 111.0	30	16.25	Lbs. oz. 1,800.0	2,087	54,690	38 in.
	13.5 "	67.0	30	13.5	1,250.0	2,016	35,230	33.4 "
	12 "	45.0	25.25	12	714.0	1,914	18,130	26.7 "
	12 (wire) "	46.0	35.43	12	850.0	2,400	33,940	36.8 "
	10 in.	29.0	32	10	500.0	2,040	14,430	26.7 "
	9.2 "	22.0	31.5	9.2	380.0	2,035	10,910	24.4 "
	8 "	15.0	29.6	8	210.0	2,150	6,730	22.8 "
	6 "	5.0	26	6	100.0	1,960	2,665	13.3 "
	5 "	0.40	25	5	50.0	1,770	1,124	9.0 "
	4 "	0.26	27	4	25.0	1,900	625	7.3 "
	4 "	0.13	14.81	4	25.0	1,180	241	..
	20-pr.	0.12	29	3.4	19.5	1,677	380	..
	12-pr.	0.7	28	3	12.5	1,710	254	..
France, B. L. Guns (made at Ruelle).	13.38 in.	52.9	35	13.38	925.9	2,624	44,230	42.5 in.
	12 "	45.9	40	12	643.7	2,624	30,750	37.3 "
	10.80 "	34.9	45	10.80	476.2	2,624	22,750	33.7 "
	9.44 "	22.4	40	9.44	317.5	2,624	15,170	29.4 "
	6.48 "	6.8	45	6.48	99.2	2,624	4,730	20.0 "
	7.63 "	10.6	40	7.63	165.3	2,624	7,898	13.4 "
Germany, B. L. Guns (Krupp).	12.01 in.	35.4	22	12.01	725.3	1,713	14,750	20.8 in.
	11.14 "	43.4	40	11.14	562.2	2,362	21,750	30.7 "
	10.33 "	21.7	22	10.33	412.3	1,588	7,211	14.5 "
	9.45 "	18.7	30	9.45	474.0	1,657	9,024	19.2 "
	9.37 "	14.6	20	9.37	306.4	1,493	4,736	12.2 "
	8.24 "	13.0	35	8.26	308.6	1,730	6,471	18.5 "
	6.79 "	5.5	25	6.79	117.9	1,608	2,112	10.2 "
	5.87 "	4.4	30	5.87	112.4	1,624	2,055	11.8 "
	5.87 "	3.4	22	5.87	76.1	1,463	1,131	7.4 "
	4.92 "	1.38	23	4.92	40.1	1,545	..	..
	4.74 "	1.35	24	4.74	33.1	1,280	..	..
	3.96 "	1.15	35	3.96	39.7	1,526	..	..
	3.43 "	0.44	24	3.43	14.9	1,545	..	..
	3.09 "	0.32	25	3.09	9.4	1,148	..	..
Italy, B. L. Guns (Armstrong).	17 in.	104.3	29	17	2,000.0	1,992	55,030	35.8 in.
	13.5 "	68.0	..	13.5	1,250.0	2,016	35,230	34.2 "
	10 "	32.0	37	10	500.0	2,208	..	23.8 "
	6 "	5.0	32	6	100.0	1,960	..	12.3 "
	4.724 "	1.2	21.6	4.724	52.0	1,345	650	6.6 "
Russia, B. L. Guns (Obukhoff).	12 in.	55.7	..	12	626.0	..	..	..
	11 "	28.2	18.8	11	496.0	1,486	7,903	14.1 in.
	9 "	19.2	17.3	9	268.0	2,376	10,500	20.4 "
	8 "	13.6	35	8	192.0	1,925	..	..
	6 "	6.2	25	6	73.3	2,080	2,682	12.3 "
United States, B. L. Guns.	13 in.	60.5	35	13	1,100.0	2,100	33,627	34.6 in.
	12 "	45.2	35	12	850.0	2,100	25,935	31.4 "
	10 "	27.6	35	10	500.0	2,100	15,285	26.3 "
	8 "	15.2	40	8	250.0	2,150	8,011	21.6 "
	6 "	6.0	40	6	100.0	2,150	3,204	15.4 "
	5 "	2.8	30	5	60.0	2,000	1,660	11.8 "
	4 "	1.5	40	4	33.0	2,000	915	10.2 "

pressed home against the base of the chamber by means of a screw working in the tube behind it. The tendency of the wedge to jump out brought the system into disfavour; but the firm of Armstrong eventually produced

the rear of the chamber. When in that position it is given a quarter turn, or, in the latest guns, even less, whereupon interrupted screws on its periphery engage corresponding female screws in the interior of the

In the interval of little more than a quarter of a century, the old spherical iron projectile, which had held its own since the earliest days of ordnance, gave way to the elongated steel projectile; and the elongated pro-

TABLE V.—*Quick-firing Guns of Great Britain and France.*

	GUN.			PROJECTILE.		BALLISTICS.		
	Calibre or Pounder.	Weight of Gun.	Length of Bore in Calibres.	Diameter in Inches.	Weight.	Muzzle Velocity, Feet per Second.	Muzzle Energy, Foot-tons.	Perforation of Wrought Iron at Muzzle.
Great Britain, Q.F.	6 in. (wire)	Tons cwt. 7.4	40	6	Lbs. oz. 100.0	2,784	5,373	22.7 in.
	4.7 "	2.07	40	4.7	45.0	2,188	1,494	11.0 "
	4 "	1.05	40	4	25.0	2,456	1,046	11.2 "
	3 "	0.6	40	3	12.5	2,200	423	8.1 "
	6-pr. "	0.4	40	2.24	6.0	1,820	138	3.7 "
	3-pr. "	0.25	40	1.85	3.3	1,875	80	3.1 "
France, Q.F.	6.48 in.	6.8	45	6.48	99.2	2,624	4,730	20.0 "
	5.45 "	4.0	45	5.8	66.0	2,624	3,160	17.7 "
	3.93 "	1.62	50	3.93	30.8	2,624	1,475	14.3 "
	2.55 "	0.58	50	2.55	8.8	2,346	..	..
	1.85 "	0.24	40	1.85	3.3	2,000	..	..
	1.45 "	0.08	20	1.45	0.99	1,310	..	..

TABLE VI.—*Quick-firing Guns of various Makers.*

	GUN.			PROJECTILE.		BALLISTICS.		
	Calibre or Pounder.	Weight of Gun.	Length of Bore in Calibres.	Diameter in Inches.	Weight.	Muzzle Velocity, Feet per Second.	Muzzle Energy, Foot-tons.	Perforation of Wrought Iron at Muzzle.
Canet Q.F. (Nordentelt, 1896).	6.3 in.	Tons cwt. 8.56	60	6.3	Lbs. oz. 101.4	2,822	6,086	25.2 in.
	5.9 "	7.0	60	5.9	83.0	2,822	4,869	23.2 "
	4.7 "	6.15	80	4.7	46.3	3,281	3,456	23.2 "
	3.9 "	3.54	80	3.9	28.6	3,281	2,140	19.7 "
	3.5 "	2.51	80	3.5	22.0	3,281	1,841	18.2 "
	2.9 "	0.89	60	2.9	13.2	2,769	695	11.4 "
	2.5 "	0.64	60	2.5	8.8	2,658	432	9.3 "
	2.24 "	0.79	80	2.24	6.6	3,150	454	11.4 "
Krupp Q.F.	9.4 in.	25.4	40	9.4	352.7	2,379	16,853	28.3 in.
	6.3 "	5.5	35	6.3	9.46	2,320	..	11.6 "
	4.13 "	3.6	35	4.13	26.4	2,320	..	7.3 "
	3.54 "	0.7	30	3.54	22.0	1,575	..	4.4 "
	3.54 "	1.15	50	3.54	22.0	2,493	950	8.4 "
	1.57 "	0.1	40	1.57	1.9	2,379	76	3.3 "
	1.57 "	0.06	30	1.57	1.7	1,575	..	1.7 "
Elswick Q.F.	8 in.	19.9	44.6	8	210.0	2,660	10,300	26 in.
	6 "	7.6	50	6	100.0	2,642	4,840	20.2 "
	4.724 "	2.75	48.9	4.724	45.0	2,630	2,158	15.1 "
	4 "	1.8	48.7	4	25.0	2,650	1,217	12 "
	3.75 "	1.65	40	3.75	25.0	2,400	1,000	11 "
	3.5 "	1.2	40	3.55	20.0	2,420	812	10.3 "
	3 "	0.57	40	3	12.5	2,200	419	7.7 "
	2.75 "	0.35	30	2.75	10.0	1,900	250	5.3 "
Elswick-Hotch-kiss Q.F.	2.24 in.	0.5	50	2.24	6.0	2,592	279	7.9 in.
	1.85 "	0.24	40	1.85	3.3	2,002	91	4.9 "
	1.46 "	0.04	25	1.46	1.1	1,460	18	1.7 "
Maxim-Nordenfolt Q.F.	4.724 in.	2.5	48.9	4.724	45.0	2,200	..	10.4 in.
	3 "	0.9	46	3	14.0	2,100	..	7 "
	2.24 "	0.3	50	2.24	6.0	2,150	..	5.8 "
	1.85 "	0.22	49.4	1.85	3.3	1,920	..	3.9 "
	1.65 "	0.15	46.1	1.65	2.5	2,010	..	3.8 "

jectile, originally supplied with studs to take the rifling of the muzzle-loader, altered its character, and, for use with the breech-loader, was fitted with circumferential 'driving bands' of soft copper, into which the grooving bit, so imparting its twist. The 16.25-inch B.L. gun of 1885, at a trial against a specially-prepared

target, drove an armour-piercing projectile through 20 in. of compound armour, 8 in. of iron, 20 ft. of oak, 5 ft. of granite, and 11 ft. of concrete, the missile coming to rest in other material in rear of the concrete. The cost of firing such a round was, roughly, £80 for powder and projectile, and £150 percentage of price of the

gun, which, without mounting, cost the country about £15,000. Towards the end of the 19th century the practice of winding the tubes of heavy guns with steel wire to give increased resistance was introduced, especially in weapons for use in the British navy.

In 1881 the British government

invited designs for a gun which should, among other requirements, fulfil the following conditions—not weigh more than half a ton; the projectile to weigh six pounds, and have a muzzle velocity of not less than 1,800 ft. per second; the projectile and powder charge to be made up in one cartridge; the gun not to require a crew of more than three men, and to be capable of firing at least twelve aimed shots a minute. The immediate result was the introduction of 3-pounder, 6-pounder, and 12-pounder quick-firing guns. In

aiming, twelve shots could be fired. The projectile perforated 4½ in. of iron at 300 yards, and 3 in. of steel at an angle of 60°. The Hotchkiss pattern at first found rather more favour in England. The gun was made of fluid compressed Whitworth steel, oil-tempered, and consisted of a tube, and of a jacket which carried the breech and trunnions. The rifling was similar to that of the Nordenfolt, save that the twist was uniform at 9'93 in. from the muzzle. At Shoeburyness the rapidity of fire for the 6-pounder was found to be about seventeen rounds a

In the case of France, only the more modern types have been given.

Nordenfolt and Driggs-Schroeder small Q.F. guns are used in the United States army. The United States have adopted for their 4-inch Q.F. the Dashiell system of breech closure, and for their larger Q.F.'s the Fletcher system.

In the preceding table the six Maxim guns of small calibre are bored to take the following service rifle cartridges: (1) Martini-Henry; (2) Männlicher, Kropatschek, and others; (3) German service rifle; (4) Lee-Enfield and Lee-Metford; (5) Dutch and Greek Männlicher; (6) United States navy rifle. See *Modern Naval Artillery* (1891); Lloyd's *Artillery, its Progress and Present Position* (1893); Ingersoll's *Text-book of Ordnance and Gunnery* (1894); Dredge's *Modern French Artillery* (1892); and Pratt's *Field Artillery* (7th ed. 1900).

(3.) MILITARY GUNS.—In the British service, field guns of a calibre not exceeding 3 inches and machine guns are classed as light artillery, while heavy field artillery, and siege and fortress guns, which vary in bore from 4 to 6 inches, are classified as of medium size. The term heavy gun is exclusively applied to the weapons of a calibre of 8 inches and upwards, which form the armament of batteries commanding important harbours or rivers. To the navy are allotted the medium and heavy guns of the most recent make and the most powerful ballistics. Subjoined is a list of some of the medium and heavy breech-loading (B.L.) guns issued to the land forces (Table VIII.). Guns of a higher calibre than 12 inches, such as the 67-ton and the 111-ton guns, are issued only to the navy. Guns of the same calibre may vary considerably in power, according to their date of manufacture. As originally constructed of steel and wrought iron, the 9'2-inch gun was capable of penetrating 15'9 inches of wrought iron at 1,000 yards. An improved type, made wholly of steel, overcomes resistance to the extent of 18'8 inches under the same conditions; while the latest wire-constructed gun has a penetration power of no less than 27'5 inches.

To the ordinary B.L. guns above tabulated must be added a few quick-firing (Q.F.) guns. A Q.F. 4-inch gun can be fired five times a minute, or more than four times faster than the corresponding B.L. gun. The newest types of B.L. guns, however, differ but little from the Q.F. guns in point of rapidity of fire. Table IX. gives particulars of the ordinary types of Q.F. guns.

TABLE VII.—Machine Guns of various Makers.

	Calibre.	Number of Barrels.	Weight of Projectile in Grains.	Muzzle Velocity, Feet per Second.	Number of Rounds per Minute.
Nordenfolt.	1'46	3	9,612	1,634	200
	1'27	2	6,187	1,542	150
	1'0	4	3,171	1,476	360
	1'0	5	3,171	1,476	250
	'45	7	480	1,253	800
	'45	10	480	1,253	1,050
	'45	12	480	1,253	1,200
	'45	1	480	1,253	180
	'45	2	480	1,253	280
	'45	3	480	1,253	420
Maxim Auto-matic.	'45	5	480	1,253	660
	1'46	1	7,000	1,319	300
	'45 (1)	1	480	1,253	600
	'315 (2)	1	231	2,100	600
	'311 (3)	1	226'S	2,035	600
	'303 (4)	1	215	2,200	600
Hotchkiss revolving cannon.	'256 (5)	1	155'1	2,320	600
	'236 (6)	1	135	2,400	600
Gatling.....	2'00	5	3'2 lbs.	1,476	40
	1'85	5	2'2 lbs.	1,304	40
	1'45	5	1 lb.	1,331	60
Gardner.....	1'0	10	3,171	..	300
	'65	10	1,422	..	..
	'45	10	480	1,331	400
Farrington....	'45	5	480	1,253	650
	'45	2	480	1,253	400
Skoda.....	'45	8	370	1,260	350
	'45	4	370	1,260	250
Colt.....	'315	1	243'S	1,903	400
	'236	1	135	2,400	400

the Hotchkiss system the breech-block moves vertically upwards and downwards at a right angle with the axis of the bore of the gun; in the Nordenfolt it works backwards on a hinge, which is fixed below the rear opening of the cartridge chamber. The original 6-pounder Nordenfolt weighed 5½ cwt., and its mounting 4'4 cwt. The rifling was on the polygroove principle, with plain section, and had an increasing twist to a point 14'93 in. from the muzzle. Without aiming, about eighteen shots a minute were fired; with careful

minute when roughly aimed, and about thirteen rounds a minute when carefully aimed. Armstrong, Maxim, and others subsequently adapted the quick-firing principle to larger guns, and made many improvements in it, especially by the use of devices to take up or prevent recoil. Canet, Krupp, and all the great continental makers have been rivals in the same field.

Some idea of the nature of the modern naval guns in use by the leading powers—weight of projectiles, etc.—may be gathered from Tables IV., V., and VI.

The ballistics of the more powerful guns, made latterly of wrought iron and steel, can be studied in Table X.

The heavy and medium R.M.L. guns are almost exclusively used for the armament of fortresses. The light R.M.L. guns—such as the 16-pounder, 13-pounder, and 9-pounder—are now utilized on land fronts or as movable armament. The 2.5-inch jointed gun is still issued to mountain batteries, in conjunction with the more modern 10-pounder B.L. gun. With the exception of the steel mountain guns, all R.M.L. ordnance consists of an inner rifled steel tube, strengthened on the outside by the superimposition of coiled or wrought iron. Rotation is given to a projectile by affixing copper studs to its sides, or a 'gas-check' to its base, which, on discharge, bear on the 'driving' side of the grooves of the rifling, and give the necessary spin.

To search cover, destroy earth-works, and even to forward an infantry attack, it may often be necessary to use high-angle fire, with relatively large shells. A howitzer of light weight, firing a formidable explosive shell at a high angle with a low velocity, is a feature in the modern fight. Horse artillery must be able to gallop and keep pace with cavalry, while field artillery with teams of six horses should be able to bring its guns into action at a trot. Table XI. gives some data as to the existing B.L. field guns and howitzers.

The 5.4-inch and the 6-inch howitzer of 25 cwt. are employed in India only; both of them form part of the siege train, whilst the former is also used for heavy batteries. The 5-inch and the 6-inch howitzers of 30 cwt. are allotted to similar duties in the imperial service. A limited number of 30-pounder (4-inch) guns have been issued to heavy batteries in India, and experiments are now being made as to the maximum weight that can be practically carried in the field. In the autumn manoeuvres of 1903 six batteries of 4.7-inch Q.F. guns were exercised with the 1st and 2nd Army Corps, and these are still retained.

The rearmament of the British field artillery with quick-firing guns is still (1906) being carried out. The British 12 and 15 pounder B.L. guns have a recoil spade suspended under the axle by a telescopic spring case. The blade is also attached by a wire rope to another spring case near the end of the trail. When the gun is fired, the teeth of the spade catch in the ground, the carriage moving over the spade. The shaft of the spade compresses

the upright spring of the axle-tree, while the wire attachment draws out the spring in the trail. After recoil the springs return the gun to the firing position.

artillery, and under favourable conditions enables a gun to fire from seven to eight rounds a minute. Attempts were also made (15-pounder, M. II.) to ease

TABLE VIII.—Medium and Heavy Breech-loading Guns.

B.L. Guns. Nature.	Mark.	Nominal Weight.	Charge. Cordite.	Projectile.	Muzzle Velocity. Feet per Second.	Penetration of Wrought Iron at 1,000 Yards, in Inches.	Range, in Yards.
4 in.	I. (jointed).	25 cwt.	Lbs. oz. 2 14	Lbs. 25	..	..	..
4 "	VI.	26 "	3 1	25	1,900	5.4	7,700
5 "	V.	40 "	4 7½	50	1,750	6.25	8,700
6 "	V.	5 tons.	14 12	100	1,890	10.2	8,000
6 "	VII.	7 "	23 0	100	2,460	14.8	12,000
7.5 "	I.	14 "	..	Experimental	..	..	..
8 "	VII.A	13 "	23 4	180	2,000	12.3	8,000
9.2 "	II.	22 "	42 0	380	1,781	15.9	10,000
9.2 "	X.	23 "	103 0	380	2,601	27.5	13,800
10 "	IV.	29 "	76 0	500	2,040	20.7	10,000
12 "	VII.	46 "	88 8	714	1,914	20.4	8,000

TABLE IX.—Quick-firing Guns.

Q.F. Guns. Nature.	Mark.	Nominal Weight.	Charge. Cordite.	Projectile.	Muzzle Velocity. Feet per Second.	Penetration of Wrought Iron at 1,000 Yards, in Inches.	Range, in Yards.
Nordenfelt 3-pr.	I.	4 cwt.	Lbs. oz. 0 6½	Lbs. 3½	1,920	1.9	4,000
Hotchkiss 6-pr.	II.	8 "	0 7½	6	1,813	2.5	4,500
12-pr.	1	12 "	1 15	12½	2,210	5	8,000
15-pr.	1	7 "	0 15.2	14½	1,640	..	6,400
2.95 in.	1	234 lbs.	0 5½	12½	920	..	4,000
4 "	III.	26 cwt.	3 9	25	2,300	6.6	9,000
4.7 "	III.	42 "	5 7	45	2,150	8	8,500
6 "	II.	7 tons.	13 4	100	2,154	11.6	10,000

TABLE X.

R.M.L. Guns. Nature.	Mark.	Nominal Weight.	Charge.	Projectile.	Muzzle Velocity. Feet per Second.	Penetration of Wrought Iron at 1,000 Yards, in Inches.	Range, in Yards.
17.72 in.	I.	100 tons.	Lbs. 450 prism.	Lbs. 2,000	1,548	23	6,400
16 "	I.	80 "	450 "	1,700	1,540	23	8,000
12.5 "	II.	38 "	200 "	818	1,575	17.7	6,500
12 "	II.	25 "	85 "	614	1,292	12	6,000
11 "	II.	25 "	85 "	548	1,360	13	6,000
10 "	II.	18 "	70 "	410	1,379	12	6,000
9 "	V.	12 "	50 "	256	1,440	10	6,000
8 "	III.	9 "	35 "	180	1,384	8	5,500
7 "	III.	6½ "	30 "	115	1,561	8	5,500
6.6 "	1	7½ cwt.	25 "	100	1,416	..	5,000
64-pr.	III.	64 "	10 R.L.G.	65	1,390	..	4,000
40-pr.	II.	35 "	6½ "	40	1,425	..	4,500
25-pr.	1	18 "	4½ "	25	1,350	..	4,500
16-pr.	1	12 "	3½ "	18	1,310	..	4,200
13-pr.	1	8 "	3½ "	13	1,595	..	6,100
9-pr.	II.	8 "	1½ "	9	1,330	..	4,000
2.5 in. (jointed).	II.	400 lbs.	1½ "	7½	1,440	..	4,000
7-pr.	III.	150 "	¾ "	7½	688	..	2,000

The force of recoil is also checked by a strong brake applied to the tyre of the gun wheels. A somewhat similar arrangement exists in the German field

the strain on the carriage by allowing the gun a *short recoil* of a few inches, by means of a cylinder acting in a spring buffer. The first nation to recognize the

value of the *long-recoil* system was the French, who now claim that they possess a gun (Ehrhardt type) which on occasion can fire thirty rounds a minute. The gun, in an over-carriage, is supported in the

(4.) MACHINE GUNS.—These are non-portable weapons, firing the same projectiles and requiring the same cartridges as infantry rifles. They can be worked by one or two men, and can bring an

from parapet mountings, from cone mountings, or from tripod mountings (of which there are several patterns), and can travel either on carriages or on pack animals. The earliest pattern of machine gun was the Gatling, which was used in the American war of secession. Later the French produced the *mitrailleuse*, which appeared in the Franco-German war of 1870-1, and which required reloading after every twenty-five charges fired.

Three different systems of machine guns have been in use in the British service—the Gardner, the Nordenfelt, and the Maxim. The Gardner gun had two parallel barrels in a horizontal plane, which were fired alternately. It was set in motion by turning a crank handle on the right of the gun, and this revolved a kind of drum called the disc crank, which was made up of several discs. Recesses in the surfaces of the two discs opposite to the barrels caused the mechanism that carried the locks to be alternately drawn back and pushed forward, and the gun to be loaded, cocked, and fired as the crank revolved. The same movement of the disc crank worked a separate mechanism, which fed the gun with cartridges from a cartridge feeder over it. The calibre was .45 inch; and the weight of the gun, with the feeder, was 92 lbs.

The Nordenfelt gun used in the British service had five parallel barrels at intervals in a horizontal plane. The mechanism comprised three principal pieces—(1) a cartridge carrier, immediately

TABLE XI.—Field Guns and Howitzers.

Nature.	Weight.	Charge. Cordite.	Projectile.	Muzzle Velocity, Feet per Second.	Range, in Yards.
30-pr. B.L. field gun.	20 cwt.	Lbs. oz. 2 6	Lbs. 30	1,621	6,300
15-pr. " "	7 "	0 15 $\frac{1}{2}$	14	1,581	6,000
12-pr. " "	6 "	0 12 $\frac{1}{2}$	12 $\frac{1}{2}$	1,585	6,000
6-in. B.L. howitzer.	30 "	1 12	122 $\frac{1}{2}$	777	5,200
6-in. " "	25 "	2 1	122 $\frac{1}{2}$	779	5,200
5.4-in. " "	13 "	0 13 $\frac{1}{2}$	60	781	3,500
5-in. " "	9 "	0 11 $\frac{1}{2}$	50	782	4,900

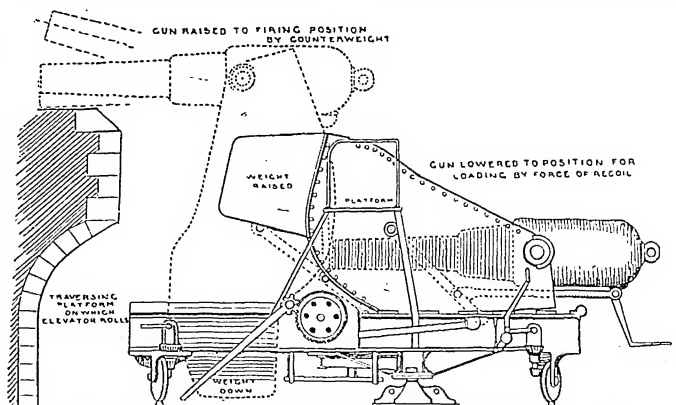
TABLE XII.—Quick-firing Guns.

Field Guns.	Calibre, in Inches.	Weight behind Team.	Muzzle Veloc- ity, Feet per Second.	Weight of Pro- jectile.	Rounds per Minute.	Remarks.
British 15-pr.	3	Cwt. qrs. lbs. 36 0 12	1,581	Lbs. oz. 14 0	7 to 8	A.F.
British (Ehrhardt) ..	3	34 3 14	1,640	14 5	20	Q.F.
German, 1896.....	3.03	33 1 23	1,525	15 0	8	A.F.
Krupp, 1901	2.95	35 1 20	1,640	14 0	20	Q.F.
French 75 mm.	2.95	37 1 17	1,640	14 to 16	30	Q.F.
Boer Creusot, 1895	2.95	35 2 12	1,955	..	8 to 10	Q.F.
St. Chamond, 1900	2.95	35 2 0	1,700	14 3	21	Q.F.
Russian, 1900.	3	..	2,000	14 0	10	Q.F.
Swiss, 1903.....	2.95	34 1 26	1,591	14 0	..	Q.F. (Krupp).

trough of an under-carriage, which contains a cylinder, with oil, spring buffer, and a piston. On recoil the gun slides along the trough or cradle, drawing the cylinder off the piston-rod, and thereby compressing the air, oil, or springs of the buffer. When the energy of recoil has been absorbed, the springs or their equivalent force the gun back into the firing position. To secure further immobility of the carriage, the trail is lengthened, and given a spade attachment, while brakes can be applied to the wheels. Table XII. gives a general idea of the present accelerated-firing (A.F.) and quick-firing (Q.F.) guns in modern field artillery.

The advisability of carrying shields for protecting the gun detachment from rifle and shrapnel fire is a matter in dispute. The French and the Swiss have adopted them. Very efficient under some conditions, they are an absolute danger under others; and there is always the serious consideration as to the extra weight in carriage that the use of them entails. The latest Krupp steel shield has a thickness of 187 inch, and practically assures the safety of those behind it against ordinary rifle and shrapnel fire.

intense and very rapid fire to bear in a short space of time. They are chiefly useful for the purpose of supplementing a deficiency in infantry fire, as when they accompany cavalry; or for bringing a



Moncrieff's elevating and disappearing Gun.

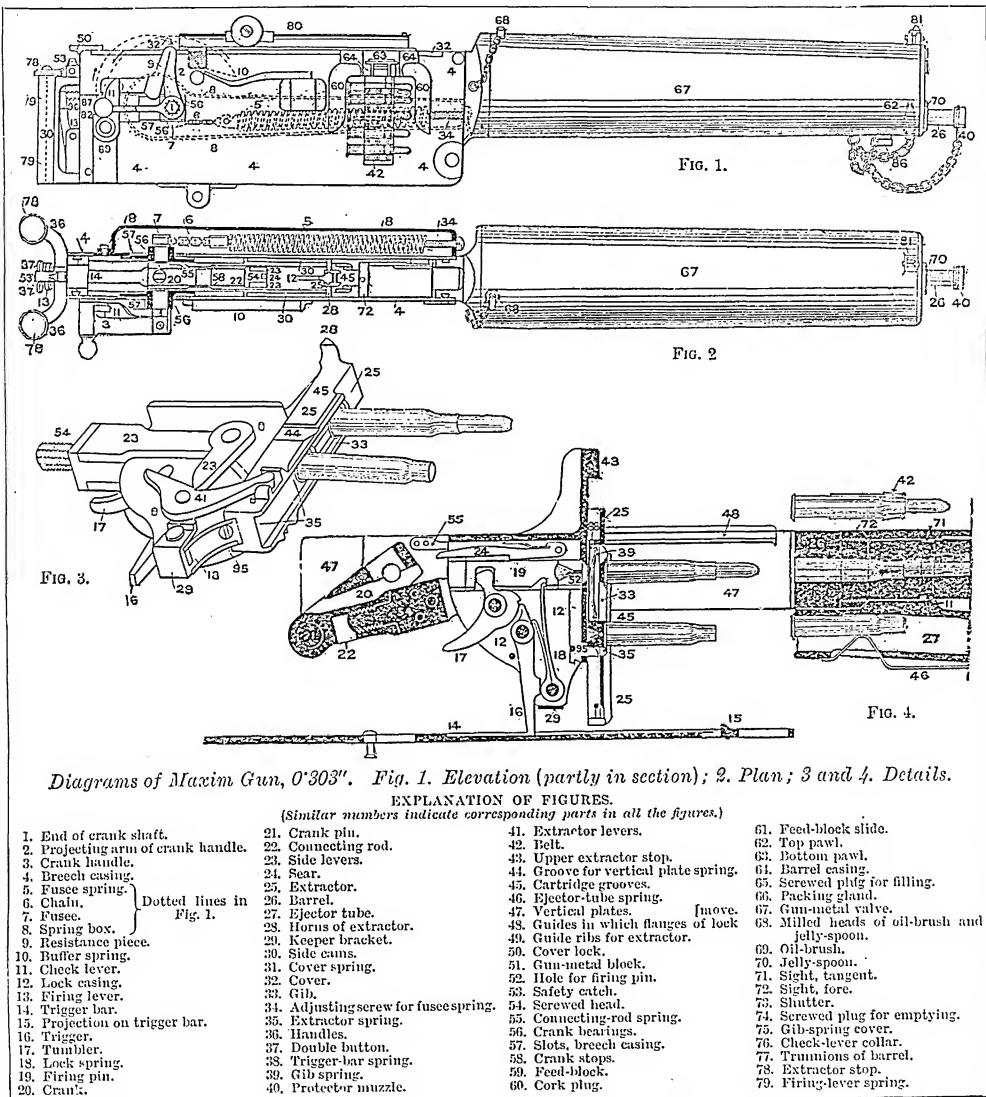
large amount of powerful masonry fire to bear over a pre-determined and limited field, as when they are used in the flank defence of works, the defence of passes, etc. Machine guns can be fired from travelling carriages,

behind the barrels, which could be given a short transverse movement from right to left and *vice versa*; (2) an action block, behind the cartridge carrier in the rear part of the gun, which contained the spiral lock springs in three

channels and the firing apparatus—this also moved transversely; and (3) a breech block, carrying on its upper surface three plungers furnished with extractors, and containing the firing pins—the breech block could be moved backwards and forwards, so that its

the present machine gun of the army, is to a great extent automatic, the force of recoil being utilized in the processes of extracting empty cartridge cases, loading, cocking, and firing the gun. The gun consists of a non-recoiling portion and of a recoiling portion.

within it. (2.) An ejector tube under the barrel casing, through which the empty cartridge cases are pushed out. (3.) A breech casing, consisting of two outside plates, a bottom plate, and a rear cross-piece; these form a kind of long trough in rear of the



body could be alternately under the action block and under the cartridge carrier, with its projecting plungers alternately in the spaces between the channels of the action block and in the recesses of the cartridge carrier.

The action of the Maxim gun,

The former comprises the following principal parts:—(1.) A gun-metal barrel casing, a cylinder which contains about seven pints of water, to keep the barrel cool, and through the lower part of which the barrel passes, free to move backwards and forwards

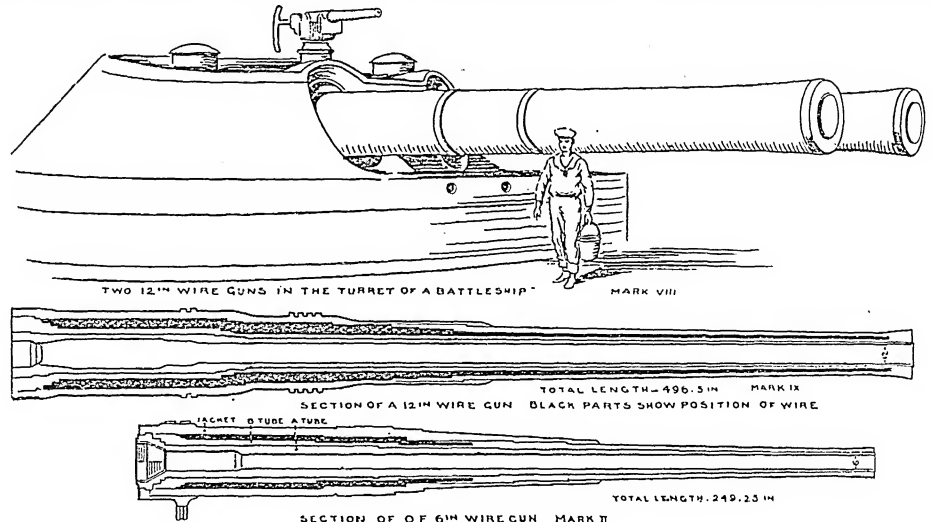
barrel casing, which is attached to it in front. (4.) A trigger bar, which is a flat bar of bronzed steel lying along the centre of the bottom plate, and so secured to it that it can slide backward and forward. (5.) Two vertical handles, borne by the rear cross-piece; which

can be grasped by the fingers of the two hands, while the thumbs are free to press the double button. (6.) The right outside plate of the breech casing is fitted outside the gun with a socket which holds a buffer spring (the use of which is to check and stop the forward motion of the crank handle), and also, in rear of the buffer spring, with a resistance piece. (7.) Outside the left outside plate are studs for affixing a removable fusee-spring box. (8.) The fusee-spring box contains a strong spiral fusee spring attached by one end to the fore end of the box, and hooked at the other end to a short chain which connects it with the fusee, a kind of metal bobbin at the extremity of the crank shaft.

The recoiling portion of the

check lever. When the gun is fired, the force of recoil causes the vertical plates and lock to fall back, thus stretching the fusee spring about an inch. The curved surface of the projecting arm of the crank then comes in contact with the flat face of the resistance piece, which causes the shaft of the crank to revolve. This action winds up the chain of the fusee spring on the fusee, and this still further stretches the fusee spring; at the same time the crank handle is thrown forward on to the buffer spring. The force of the recoil being expended, that of the fusee spring reasserts itself, and drags the whole recoiling portion forward again. The firing pin is a piece of steel, square in section, but provided with a point at its forward end. It is held between the

between the lower gib projection and its own, the empty case of the cartridge just fired. Under the force of recoil the extractor is carried back with the rest of the lock, and in this backward motion the extractor draws out the new cartridge from the feed-belt above the barrel, as well as the empty case from the barrel. When it drops, these are clear of the belt and barrel, and respectively fall opposite to the barrel and to the ejector tube below it. The forward motion of the lock now takes place, and pushes the new cartridge into the barrel and the empty case into the ejector tube, the case pushing out before it the empty case left there. The feed-belt by which cartridges are supplied to the gun is formed of two pieces of webbing riveted to-



Wire Guns.

gun is, with the exception of the barrel, contained within the non-recoiling breech casing. It comprises the following parts:—(1.) A barrel (of either '303-inch or '45-inch calibre) which can move a certain distance backwards and forwards through the water in the barrel casing. The breech is attached by studs or barrel trunnions to the vertical plates. (2.) Two vertical plates (between them is the lock), which, placed inside the two outside plates, can slide backward and forward. (3.) The crank, having a shaft on which it revolves, and by which it is supported.

The inner arm of the crank and the connecting rod are nearly in a horizontal straight line when the lock is up against the breech of the barrel, and the end of the handle is then resting on the

lock-plates in a horizontal position, so as to be opposite to the barrel, and it can slide backward or forward a certain distance between the plates. Above and to the rear of the trigger is the tumbler, pivoted (like the trigger) between the lock-plates. If the tumbler be turned by pressure on its tail, it will carry back the firing pin, compressing the lock spring. If the trigger be held back out of the tumbler by continued pressure of the thumbs on the double button, the gun will go on firing automatically as long as cartridges follow one another into the chamber of the barrel.

When the gun is fired the extractor is up, holding with its grooves and gib a new cartridge from the feed-band above the barrel, and also, lower down,

gether. The breech casing has an opening on the right through which the feed-belt presses into and through the feed-block, after which it passes out of the gun by an aperture on its left.

The Maxim gun will fire as many as 450 rounds per minute. Each belt of ammunition is carried in a separate box, and contains either 150 cartridges of '45-inch calibre or 250 of the '303-inch. A cavalry travelling carriage carries fourteen and an infantry carriage sixteen boxes of ammunition. There are two varieties of these guns, the '45-inch and the '303-inch. Each weighs 60 lbs., but the former is now becoming obsolete. See Ede's *Guns and Gun-making Material* (1889), and the government series of *Handbooks* on naval and military guns,

Güns, Hungary. See KÖSZEG.
Gunter, ARCHIBALD CLAVERING (1847), English novelist and playwright, born in Liverpool, but eventually settled in New York, and began to write plays, such as *Prince Karl*, *Mr. Barnes of New York*, *Two Nights in Rome*, *The Deacon's Daughter*, and *Fresh the American*. Among his numerous novels may be mentioned *Mr. Barnes of New York* (1887); *Mr. Potter of Texas* (1888); *That Frenchman* (1889); *Miss Nobody of Nowhere* (1890); *A Manufacturer's Daughter* (1901); *Phil Conway and The Conscience of a King* (1905).

Gunter, EDMUND (1581-1626), English mathematician, born in Hertfordshire, and became professor of astronomy at Gresham College, London (1619). He invented 'Gunter's chain,' used in land surveying; 'Gunter's line,' 'Gunter's quadrant,' and 'Gunter's scale;' he also published a table of *Logarithmic Lines and Tangents* (1620), and introduced the expressions 'co-sine' and 'co-tangent.' He also discovered the variation or changeable declination of the magnetic needle. To his friend Briggs he suggested the use of the arithmetical complement.

Günther, ALBERT KARL LEWIS GOTTHILF (1830), German zoologist, born at Esslingen, Württemberg; became connected with the zoological department of the British Museum (1856), from which he retired in 1895. Sixty-three volumes of descriptive catalogues have been prepared under his supervision. He founded the *Record of Zoological Literature* in 1864, and has written *Catalogues of Snakes*.... and *Fishes in the British Museum* (10 vols. 1858-70); *Reptiles of British India* (1864); *Gigantic Land Tortoises* (1877); *Introduction to the Study of Fishes* (1880); *Reports on the 'Challenger' Fishes* (1881-5); *Reptiles and Batrachians of Central America* (1885-1902).

Günther, JOHANN CHRISTIAN (1695-1723), German poet, born at Striegau in Silesia, was one of the most original and gifted lyric poets of his time. His poems have a freshness and depth of emotion which make them still readable. They have been edited, with biography, by J. Tittmann (1874), and by L. Fulda (*Kürschners Deutsche National-litteratur*, vol. xxxviii.). See Roquette's *Leben und Dichten J. C. Günthers* (1860).

Guntur. See GANTUR.

Gurdaspur, chief tn. of dist. of same name in Punjab, India, 45 m. N.E. of Amritsar. The district is 1,889 sq. m. in area, and has a population of (1901) 940,334. Dalhousie sanatorium is attached to Gurdaspur.

Gurgaon, dist., Punjab, India, has an area of 1,984 sq. m., and a population of (1901) 746,208. There are cotton-pressing and indigo factories. Gurgaon, 15 m. S.W. of Delhi, is the capital. Pop. (1901) 4,765.

Gurhwal. See GARHWAL.

Guriev (formerly Yaitskiy Gorodok), tn., gov. Uralsk, Russia, on r. bk. of Ural, 11 m. above its mouth in the Caspian Sea; has important fisheries. Pop. about 9,500.

Gurjun Balsam, or WOOD OIL, is obtained from *Dipterocarpus trinervis* and allied species by incision, and by the application of slow heat to the wound. It is procured in Burma and the Malacca States, and yields about one-third its weight of a volatile oil by distillation. It is used medicinally to alleviate or prevent leprosy, as a substitute for copaiba balsam, and as a varnish.

Gurkhas. See GHURKAS.

Gurnall, WILLIAM (1617-79), English theologian, born near Lynn in Norfolk. He became rector of Lavenham, Suffolk, in 1644. He was author of *The Christian in Compleat Armour* (3 vols. 1655; reissued, 1865, by Bishop Ryle, with a biographical sketch).



Gurnard (Trigla hirundo).

Gurnard, a spiny fish belonging to the genus *Trigla* and family Cottidae. There are seven British species, the more important being the gray gurnard (*T. gurnardus*), the tub or latchet (*T. hirundo*), the red gurnard (*T. cuculus*), and the piper (*T. lyra*). Gurnards live upon crustacea, as small crabs and shrimps, also upon fishes and echinoderms. They spawn in summer, the eggs being buoyant or pelagic. The gurnards have the power of emitting faint, grunting sounds, produced in the air-bladder; hence they are sometimes called 'crooners' in Scotland. They are much used as food in England.

Gurney, EDMUND (1847-88), English psychologist, born at Horsham in Surrey. The theory and practice of music early claimed his attention, and he wrote *The Power of Sound* (1880), and also *An Epilogue on Virginitation* (1881-2). One of the founders of the Society for Psychical Research, he studied spiritualism, telepathy, hypnotism, etc., and, with F. W. H. Myers and F. Podmore, edited *Phantasms of the Living* (1886). In 1887 appeared *Tertium Quid: Chapters in various disputed Questions*.

Gurney, SIR GOLDSWORTHY (1793-1875), English inventor, was born at Treator, near Padstow in Cornwall. He produced the oxyhydrogen blowpipe, the 'Drummond' light (lime-magnesia), and was the first to apply the steam jet or blast to steamboats. He experimented successfully on steam locomotive power, and ran a steam carriage to Bath and back; applied the principle of the 'Gurney stove' to heating the House of Commons, and superintended the lighting and ventilation of the Houses of Parliament (1854-63). He published *Observations... to Identify Lighthouses* (1864).

Gurney, JOSEPH JOHN (1788-1847), English Quaker and philanthropist, was born at Earldham Hall, near Norwich; joined the ministry of the Society of Friends, engaging actively in social work in alliance with Zachary Macaulay, Wilberforce, Fowell Buxton, and others. He was supported by his sister, Elizabeth Fry, in schemes of prison reform, and was active in efforts for slave emancipation. His chief works are *Prison Discipline* (1819); *Religious Peculiarities of the Society of Friends* (1824); *Hints on the Portable Evidence of Christianity* (1832); *A Winter in the West Indies* (1840). See Augustus Hare's *The Gurneys at Earldham* (1895).

Gussets, in engineering, plain triangular pieces of plate iron riveted by their vertical and horizontal legs to the sides, tops, and bottoms of box girders, etc., inside, for strengthening their angles. A gusset stay is a diagonal stay usually made of a single plate of iron for strengthening the ends of boilers.

Gustavus I. (Vasa), king of Sweden (1523-1560), born at Lindholm, in Upland, in 1496. He bore the Swedish standard at the battle of Brännkyrka (1518) when Sten Sture defeated Christian II. of Denmark, and was one of the hostages on the Swedish side during the ensuing negotiations. He was, however, treacherously carried off by the Danes and imprisoned at Kalb, near Aarhus in Jutland, but escaped. Utilizing the national indignation at the Stockholm 'blood-bath,' he incited the peasantry of the Dale (Dalecarlia) to rise in revolt at Mora (1520). He drove out the Danes, and was proclaimed king by the Parliament of Strengnäs. After securing himself against restoration projects from the Danish side by the treaty of Malmö (1524) with Frederick I., he determined to strengthen the monarchy by putting down the wealthy hierarchy and introducing the reformation. The reformation was carried through at the Parliament of Westeras (1527).

Gustavus gradually accustomed his subjects to the rule of law and order by regulating taxation, introducing administrative and economical reforms, but, above all, by endearing them to his person. Agriculture, the mining industries, trade and commerce, greatly developed during his reign. He also freed the land from the crushing privileges of the Hanseatic League, and laid the foundations of a navy. At the Parliament of Westeras (1544) the crown was made hereditary in his family. See Fryxell's *Leben u. Thaten Gustavs I. Wasa* (1831); P. B. Watson's *The Swedish Revolution under Gustavus Vasa* (1889); R. N. Bain's *Scandinavia*.

Gustavus II. (Adolphus), king of Sweden (1611-32), son of Charles IX., was born at Stockholm in 1594. His tact and wisdom gradually gained over the wealthy nobles whom his stern father had attempted to crush, and persuaded them to take the chief burdens on their own shoulders. Yet he protected the lower classes against the tyranny of the landowner, reorganized the government, and placed it in the hands of a well organized bureaucracy. Moreover, commerce was promoted, new towns built, and everything done to restore the national credit and prosperity. The war against the Danes, who, at the time of his accession, held the whole of Southern Sweden, was terminated by the not inglorious peace of Knäröd (1613), whilst the Russian war was concluded four years later by the extremely advantageous treaty of Stolbova (1617), whereby Sweden acquired Karelia and Ingria. The war with Poland, on the other hand, dragged on for nine years, in the course of which Gustavus won (1621-99) the provinces of Livonia, Esthonia, and Courland. Peace with Poland at length left him free to turn his attention to Germany, and in response to appeals for help from the hard-pressed Protestants of the empire, he landed on the isle of Usedom in the summer of 1630. After a cautious and successful campaign in Pomerania, he attempted to relieve Magdeburg; but his plans were frustrated by the jealous suspicions of his nominal ally, the Elector George William of Brandenburg. He did, however, make a demonstration against Silesia, and stormed Frankfurt-on-Oder and Landsberg. Magdeburg fell on May 20, 1631; but its cruel fate at the hands of Tilly threw the Elector John George of Saxony into the arms of the Swedes. In the following September, Gustavus won against Tilly the decisive battle of Breitenfeld, near

Leipzig (Sept. 17, 1631). He then marched through Thuringia and Franconia to the middle Rhine. After wintering at Mainz (Mayence) he united at Kitzingen with the Swedish general Horn, and started in pursuit of Tilly. On April 15 his superior artillery enabled him to force the passage of the Lech against the imperialist general, who was killed, and the whole of Bavaria lay defenceless before him. Gustavus, having failed to prevent Wallenstein's junction with Maximilian of Bavaria at the beginning of July, entrenched himself at Nürnberg, and was repulsed in a murderous attack (September) upon Wallenstein's entrenched camp. Nevertheless Wallenstein retreated, and Gustavus hastened after him by forced marches, and overtook him on the plain of Lützen, near Leipzig, where, on Nov. 16, 1632, after a severe encounter, Wallenstein was compelled to fall back upon Leipzig, with the loss of several guns. Gustavus Adolphus fell in the battle. See Fletcher's *Gustavus Adolphus and the Struggle of Protestantism* (1890); J. L. Stevens's *Life and Times of Gustavus Adolphus* (1885); Geijer's *Svenska Folkets Historia*, vol. iii. (1832-6); Droysen's *Gustav Adolf* (1869-70).

Gustavus III., king of Sweden (1771-92), eldest son of Adolphus Frederick, was born in 1746. His first step after his accession was to overthrow the oligarchical tyranny of the nobles by the bloodless *coup d'état* of Aug. 19, 1772. During the following twelve years Gustavus regenerated Sweden, reforming abuses, promoting commerce and agriculture, replenishing the exchequer, encouraging the arts and letters. On the other hand, he maintained a court of extraordinary splendour, which became a burden to the people. The mutinous attitude of the Parliament of 1786, and his declaration of war against Russia in 1788 without consulting Parliament, brought matters to a head. The open mutiny of his officers paralyzed his efforts in Finland, and in 1788 the Danes, under the terms of a treaty with Russia, invaded Sweden. But Gustavus saved Gothenburg, and compelled the Danes to make peace. The Russian war, which dragged on for two years longer, was ended by the almost complete annihilation of the Russian fleet at the battle of Svensksund (July 1790). Meanwhile a section of the nobility formed a plot to assassinate Gustavus, and he was shot by Anckarström at a masquerade at the opera-house. See R. N. Bain's *Gustavus III.* (1894).

Gustavus IV., king of Sweden (1792-1809), only son of Gustavus

III., was born at Stockholm in 1778. In 1800 he joined the armed neutrality of the northern powers, and after working (1803) for the restoration of the Bourbons, joined the coalition against Napoleon, against whom he conceived an almost childish hatred, which led him to lose Rügen and Stralsund rather than accept the favourable conditions of peace offered to him by Napoleon in 1807. Napoleon induced the Russians to invade Finland, which they did without previous declaration of war, and ultimately they conquered and annexed it (1808-9). When England advised him to make peace, Gustavus retaliated by laying an embargo on all British vessels in Swedish ports. These actions at length constrained his own subjects to depose him (May 1809). Gustavus retired to Switzerland, where he died at St. Gall (1837). See *Memorial des Obrist Gustavs* (1829), the king's own autobiography.

Güstrow, tn., Germany, grand-duchy of Mecklenburg-Schwerin, 21 m. by rail s. of Rostock, with a large wool trade. It has also engineering-shops, sugar factories, brickworks, breweries, and sawmills. Here is a 13th-century cathedral. Güstrow was from 1555 to 1695 the place of residence of the dukes of Mecklenburg-Güstrow. Pop. (1900) 16,882.

Gut, a term which is applied in zoology to the whole of the alimentary canal, as distinct from the coelom or body-cavity. In all vertebrates, and in those invertebrates which possess a completely differentiated alimentary canal, this consists of three parts—the stomodæum or fore-gut, the mesenteron or mid-gut, and the proctodæum or hind-gut. The stomodæum and proctodæum arise in development by inturning of the ectoderm or outer layer of the embryo. Always large in invertebrates, they are greatly reduced in extent in vertebrates, where they typically form respectively the lining of the mouth-cavity, and a small area in the region of the anus. The mesenteron arises in development from the endoderm or inner layer, and is lined by the true digestive cells. In invertebrates, where its area is small, it gives rise to the so-called digestive gland. In vertebrates it forms almost the whole of the alimentary canal, and therefore it gives rise to such outgrowths of the alimentary canal as lungs, liver, and pancreas. Where gills are present, as in fishes, they also arise from the mesenteron. It may thus be said that, while the mid-gut of invertebrates is concerned only with nutrition, in

vertebrates it is concerned alike with nutrition and respiration.

Cat-gut—made of the intestines of sheep, cleansed, scraped, bathed in alkali, treated antiseptically by sulphur, dried, twisted, and assorted—is used for strings of musical instruments, clocks, and kindred purposes. The outer membrane, when scraped off, is used as an envelope for puddings and sausages. *Gold-beater's skin*, for dressing wounds and making gold-leaf, is another form of preparation. *Fine gut* for fishing is obtained from the silkworm, placed, when about to spin, in vinegar, split, and drawn out into lengths.

Gutenberg, JOHANN GENS-FLEISCH, or **HENNE** (1397-1468), German printer, born at Mainz. About 1454 he elaborated the idea of printing with movable types, though it is probable he had been anticipated by one or two obscure mechanicians. It is not known that any books were printed until after he returned to Mainz (1444), and entered into partnership with a goldsmith named Faust or Fust (1450). Five years later Faust brought an action against Gutenberg, and secured possession of the work done and the press. Gutenberg continued to print, but his commercial success was not great. In 1465 the Elector of Nassau gave him a benefice with an assured income and certain privileges. He died at Mainz. Amongst the best work commonly attributed to him are *The Bible of 36 Lines* (2 vols. fol., printed before 1460), *The Bible of 42 Lines* (2 vols. fol., 1450-5, known as the Mazarin Bible, a copy of which on vellum was sold at the Perkins sale, 1873, to Lord Ashburnham for £3,400, and a copy on paper for £2,690), and the *Catholicon* (a Latin dictionary, and the fourth book printed with a date) of 1460. On the question of the first inventor of movable types see **COSTER**, and **PRINTING**. See E. C. Pearson's *Gutenberg and the Art of Printing* (1871); J. H. Hessels's *Gutenberg* (1882); V. Zatzman's *Gutenberg* (1900); G. Zedler's *Gutenbergforschungen* (1901); O. Hupp's *Gutenbergs erste Drucke* (1902).

Gütersloh, tn., Prussian prov. of Westphalia, 11 m. by rail s.w. of Bielefeld; manufactures linens and silks, trades in Westphalian hams and sausages, and is famous for its *pumpernickel* (brown bread). Pop. (1900) 7,100.

Guthlac, St. (c. 673-714 c.), born of noble parents among the Middle Angles, led a hermit's life at Crowland in the Fens. See Felix of Crowland's *The Anglo-Saxon Version of the Life of St. Guthlac* (ed., with trans., by C. W. Goodwin in 1848).

Guthrie, city and cap. of Oklahoma, U.S.A., co. seat of Logan co., has had a marvellous growth since it started in 1889. Pop. (1900) 10,006.

Guthrie, SIR JAMES (1859), Scottish painter of the Glasgow school, born at Greenock; was taught by John Pettie, and in the 'eighties joined the young Glasgow painters in the Highlands who worked in the open air, in accordance with the traditions of the 18th-century British school. Cosmopolitan in taste, his realistic tendency is guided by sympathetic insight and keen personal feeling. Notable among his works are *The Funeral in the Highlands* (1882), *To Pastures New* (1885), and his diploma picture for the Royal Scottish Academy, *Midsummer*. Latterly he has devoted himself to portraiture. In 1903, Mr. Guthrie was elected president of the Royal Scottish Academy. See David Martin's *The Glasgow School of Painting* (1902).

Guthrie, THOMAS (1803-73), Scottish preacher and philanthropist, born at Brechin in Forfarshire. He was, in 1830, presented to the living of Arbirlot in Forfarshire. Seven years later he became one of the ministers of Old Greyfriars, Edinburgh, and in 1840 minister of St. John's Territorial Church. At the disruption of 1843 he followed Dr. Chalmers, and was for more than twenty years minister of Free St. John's, Edinburgh. Dr. Guthrie was one of the most eloquent preachers of his day, and many of his works—*The Gospel in Ezekiel* (1856), *The Way to Life* (1862), *The City: its Sins and Sorrows* (1857)—were widely read. From 1864 till his death he edited the *Sunday Magazine*. In 1845-6 he raised £116,000 for providing manses for the Free Church ministers, and in 1847 the publication of his famous *Plea* gave an impulse to the formation of Ragged Schools. See his *Autobiography*, with a memoir by his sons (1874), and a *Biography* of him in Famous Scots Series, by Oliphant Smeaton (1896).

Guthrie, THOMAS ANSTEEY. See **ANSTEEY**.

Guthrie, WILLIAM (1708-70), Scottish writer, born at Brechin in Forfarshire; went to London (1730), and obtained work on the *Gentleman's Magazine*. He wrote *Hist. of England* (1744-51), *General History of the World* (1761-67), and *General History of Scotland* (1767), and a very successful *Geographical, Historical, and Commercial Grammar* (1770).

Guts Muths, JOHANN CHRISTOPH FRIEDRICH (1759-1839). German educationist, born at Quedlinburg; was (1785-1837) a teacher at Schneppenthal in the Thürin-

gerwald. He instituted a new method of teaching geography, and is largely responsible for the system of gymnastics introduced into German schools. He is chiefly known for his handbooks on these subjects, and the book *Deutsches Land und Deutsches Volk* (1820-32). See *Life*, in German, by Wassmannsdorf (1884).



Gutta-percha Tree (Dichopsis Gutta).

1. Bud; 2. flower; 3. fruit.

Gutta-percha is a substance bearing a great resemblance to india-rubber. Although long known in Europe, it was only brought into prominent notice by William Montgomery in 1842. It is found mainly in the Malay Peninsula, Borneo, Sumatra, Ceylon, etc. In the old days it was obtained by felling the tree and stripping off the bark, when the gutta-percha was exuded as milky juice. Nowadays, alternate sections of the bark are stripped off—so much one year, so much next—thus allowing the tree to grow unchecked. The milky juice soon coagulates on exposure to the air, assuming a dark brownish-white colour. The discovery of its wonderful insulating power opened up a wide field for its employment.

The method of treatment somewhat resembles that employed for india-rubber. After being

cleaned, it is kneaded between rollers, under a supply of running water, and finally run out into thin sheets, so as to expel the air in it, and allow it to be readily dried and freed from moisture. It is then put into a machine called a masticator, consisting usually of a hollow, fluted roller, revolving inside an outer hollow casing, both the roller and casing being heated by steam, and is made to revolve until in a fit condition for working.

Gutta-percha is a leathery solid that, though elastic, is not flexible, or resilient, like india-rubber. It becomes plastic at about 65° c., and burns brightly when set on fire. It is very resistant to acids and alkalis, and is probably mainly composed of a hydrocarbon of the formula $C_{10}H_{16}$, and its oxidation products. It can be bleached by solution in carbon disulphide and filtration through animal charcoal, and differs from india-rubber in that it is not 'vulcanized' by heating with sulphur. Gutta-percha is mainly employed for the electrical insulation of wires. Its resistance to acids also renders it valuable in chemical works and glass works, where it is employed for jars, pipes, and other purposes. Bleached gutta-percha may be coloured with various pigments—as, for instance, to match the colour of the gums as a mounting for artificial teeth. Finally, gutta-percha is largely employed in the manufacture of golf balls. See Obach's *Die Guttapercha* (1899), Brant's *India Rubber, Gutta-percha, and Balata* (1900), and Hoffer's *Caoutchouc and Gutta Percha*.

Guttiferae, a natural order of trees and shrubs with opposite, entire, coriaceous leaves, and with a yellow resinous juice. Among the genera are *Clusea* and *Mammea*.

Gutzkow, KARL FERDINAND (1811-78), German dramatist, born at Berlin. The circulation of his works was stopped, and he was imprisoned for three months, on account of his *Wally, die Zweiflerin* (1835), an outrageous novel, and one of the rationalistic manifestoes of *das junge Deutschland*. After a stay at Hamburg (1837-42), he received (1847) an appointment as dramatic adviser to the Court Theatre at Dresden. From 1861-64 he was at Weimar; after this he did not settle down again. Gutzkow's principal works are the historical comedies *Zopf und Schwert* (1844) and *Das Urbild des Partifische* (1847), and the tragedy *Uriel Acosta* (1847; Eng. trans. 1885), and the novels *Die Ritter vom Geiste* (1850-2) and *Der Zauberer von Rom* (1858-61). His intense desire to contribute his share to all the burning questions of the

day has tinged most of his work and deprived it of lasting value; and his neglect of the formal side of literature, as well as his love of criticism and reflection, seriously impair the merit of his novels and dramas as works of art. His dramatic works appeared in 20 vols. (1871-2), and most of his novels and literary criticism in 12 vols. (1873-6). He has supplied autobiographical data in *Aus der Knabenzeit* (1852) and *Rückblicke auf mein Leben* (1875). See Prölss's *Das junge Deutschland* (1892).

Gützlaff, KARL FRIEDRICH AUGUST (1803-51), German Chinese scholar and missionary, born at Pyritz in Pomerania. Working at Batavia, Singapore, Bangkok, Macao, and Hongkong, first for the Netherlands Missionary Society, and then independently, he acquired a thorough knowledge of Chinese, into which he translated the Bible. He published several works in Chinese and in English, and was in 1835 joint-secretary to the English commission, rendering valuable service during the opium war of 1840-2.

Guy, THOMAS (?1644-1724), founder of Guy's Hospital, London, was born in London, and apprenticed to a bookseller. From 1695 to 1707 he represented Tamworth (Staffordshire) in Parliament. By successful speculation in the shares of the South Sea Company, he realized a fortune of about half a million sterling. Among his charitable works may be mentioned the foundation of an almshouse at Tamworth in 1678, the building of the Tamworth town hall in 1701, and the endowment of Christ's Hospital with £400 a year. In 1707 he built three wards at St. Thomas's Hospital, and in 1721 he began the erection of Guy's Hospital, on which he spent £18,793. To this institution he left in his will a sum of about £220,000.

Guyenne. See GUIENNE.
Guy of Warwick, an old metrical romance, apparently of Saxon origin, but improved by some French or Anglo-Norman writer, existed in French in the 13th century. During the 13th century the story became very popular, and was translated into English. There is an edition by Zupitza in 1883, etc. See Tanner's *Die Sage von Guy von Warwick* (1877).

Guyon, MME., née JEANNE-MARIE BOUVIER DE LA MOTTE (1648-1717), French mystic, born at Montargis, dep. Loiret. After the death of her husband (1676), she went to Savoy and began to preach her doctrine of quietism, a mystical annihilation of self in love. In 1686 she settled in Paris; but she was accused of

immorality and of sharing the errors of the Spanish mystic Molinos, and was imprisoned (1688, 1695-1702). But Fénelon supported her against Bossuet in a quarrel which greatly agitated the French court. Finally Rome, under pressure from Louis XIV., decided for Bossuet. Her *Oeuvres* appeared in 40 vols. at Paris in 1790. See her *Autobiography* (trans. by Allen, 1897), Guerrier's *Mme. Guyon* (1881), and *Life by Upham* (1905).

Guyon, RICHARD DEBAUFFRE (1803-56), born at Walcot, near Bath in England; emerged as a hero of the Hungarian revolution of 1848. He defeated the Austrians repeatedly in 1848-9, and raised the siege of Komorn, but the surrender of Görgei forced him to fly to Turkey.

Guyot, ARNOLD HENRY (1807-84), Swiss geologist, born in the canton of Neuchâtel; took part with Agassiz in his Alpine investigations, and was appointed (1839) professor at Neuchâtel. His *Earth and Man* (1853; new ed. 1875) comprises lectures which he gave in America, where (at Cambridge, Massachusetts) he settled in 1848. He collected material for the Smithsonian *Geological and Physical Tables* (1851-9; new ed. 1884), studied the geological formation of the Alleghanies, and was appointed (1853) professor of geology and physical geography at Princeton, where he remained till his death. He published a *Memoir of Louis Agassiz* (1883). See Faure's *Notices sur Arnold Guyot* (1884).

Guyot, YVES (1843), French journalist and publicist, who, during the South African war of 1899-1902, ranged himself on the side of Great Britain. He was born at Dinan (Côtes-du-Nord), and his first appointment was that of editor of the *Indépendant du Midi*, a Liberal journal at Nîmes, in 1868. He became political director of the *Siècle* in 1892, and still filled that position in 1904. He was the first French journalist to raise his voice in protest against, and to expose, what he regarded as the evils of the system embodied in the Police des Mœurs (the prostitution police), which led to his imprisonment for several months. It was M. Guyot who, in the *Siècle*, first cast suspicion upon the verdict in the notorious Dreyfus trial. He is a keen free trader. His contributions to economic literature include *La Science Economique* (1881; 3rd ed. 1903); *The Sugar Question* (1901); with M. Arthur Raffalovich, *Dictionnaire du Commerce, de l'Industrie et de la Banque* (1898-1901); and *La Tyrannie protectionniste* (1905). He has also published several works on socialism, of which

he is a consistent opponent, and on labour questions—*c.g. Conflits du Travail et leur Solution* (1903). M. Guyot has been a member of the Chamber of Deputies (1885-92), and was minister of public works in the cabinets of M. Tirard and M. de Freycinet (1889-92).

Guzel-Hissar. See AIDIN.

Guzerat. See GUJARAT.

Guzman-Blanco, ANTONIO (1829-99), president of Venezuela, born at Caracas; fought as a Federalist under General Falcon, and was elected president of the Assembly which transformed Venezuela into a confederation on a democratic basis. Between 1870 and 1889 he was generally titular president, and always virtual dictator, of Venezuela, and during that period re-established public credit, promoted education, and opened the first railway in Venezuela.

Guzmania, a genus of tropical American plants belonging to the order Bromeliaceæ. The stove plant *G. tricolor* derives its name from the conjunction of its white flowers with the green and scarlet bracts which cover the stalks.

Gwadur, small seapt., on S.W. coast of Baluchistan, 300 m. W. of Karachi.

Gwalior. (1.) Maratha state in Central India, between the United Provinces and the Central Provinces, with an area of over 29,000 sq. m. Pop. (1901) 2,149,958. (2.) Capital of the above state, lies 65 m. S. of Agra by rail. The chief features are the palace of the Maharajah Scindia and the huge fortress. Pop. (1901) 118,200.

Gwelo, post and magistracy in S. Rhodesia, British S. Africa, 110 m. N.E. from Bulawayo.

Gwyniad, or POWAN. See CORREGONUS.

Gwynn, GWYN, or GWYN, NELL (1630-87), English actress, and mistress of Charles II. Her early life is obscure. She appeared on the stage in 1665, played piquant, bustling parts, and was a general favourite; but retired in 1682. By Charles II. she bore two sons—Charles Beauclerk (1670), afterwards Duke of St. Albans, and James (1671), who died young.

Gyarus, or GIURA, small island of the Cyclades, in the Ægean Sea, S.W. of Andros; a place of banishment under the Roman empire.

Gyges, first king of Lydia, of the dynasty of the Mermaidæ; he dethroned Candaules, the last king of the Meonian dynasty, about 700 B.C. He fought against the invading Cimmerians, and sent soldiers to Egypt to help that country to free itself from Assyrian rule. But the Cimmerians returned, killed Gyges, and took his capital, Sardis.

Gylippus, Spartan general. When Syracuse was besieged by the Athenians in 414 B.C., the Spartans sent Gylippus to its aid, and he and the Syracusans compelled the surrender of the whole Athenian force in 413 B.C. Some time later he was convicted of having stolen some of the treasure from captured Athens, and exiled.

Gyllembourg = Ehrensward, THOMASINE CHRISTINE (1773-1856), Danish novelist, *née* Buntzen, married (1790) P. A. Heiberg, to whom she bore the famous J. L. Heiberg. After being divorced (1799), she married the Swedish Baron Ehrensward. She was already fifty-three when she contributed her first novel, *Familien Polonius* (1827) to the journal *Flyvende Post*; this was followed in 1828 by *En Hverdags-historie*, which made her famous, *To Tidsaldre*, and many more romances, descriptive chiefly of life in Copenhagen. All her works are remarkable for depth and delicacy of characterization, and for poetic treatment of real life. See *Skriften* (1849-51; new ed. 12 vols. 1884), and L. Heiberg's *P. A. Heiberg og Thomasine Gyllembourg* (1882).

Gyllenborg, CARL, COUNT (1679-1746), Swedish statesman, born at Stockholm, was appointed secretary at the Swedish Legation in London (1703), where he became deeply implicated in Baron Görtz's Jacobite plot (1717). After some vicissitudes he became leader of the Hat party, and succeeded Count Horn as chancellor in 1739, a post he kept till his death.

Gyllenstjerna, JOHAN (1635-80), Swedish statesman, born at Elfsjö, near Stockholm. Vigorously opposing the unfortunate foreign policy of the regency (1668), he became in 1676 the omnipotent minister of Charles XI. (1676). His foreign policy resembled that of the Dane Griffenfeld—peace on a pan-Scandinavian defensive basis. His policy triumphed at the peace congress of Lund (1679).

Gymnastics. The practice of gymnastics in an organized form, and as a part of education, originated with the Greeks. During the early years of a child's life in Greece physical training and care of the health formed perhaps the chief items in his education, whilst the moral training—as then understood—was also undertaken at the gymnasium. In the great religious festivals of Greece the public games played a commanding and essential part, each state sending forward competitors. The training of these competitors was eventually carried out at the expense of the state; but as time went on, and

the practice of gymnastics developed into a social institution, the gymnasia were applied to the education of the mind and the study of medicine—approximating, in fact, to the curriculum of the higher grade schools of the present.

Plato, writing on education (see various parts of *Leges*), devotes much consideration to the necessity of gymnastic training for the young; and about this time, Prodicus, who was the first to notice the intimate connection between the practice of gymnastics and health, designed a system of exercises, which were afterwards improved by Hippocrates (400 B.C.). The principal exercises were running, leaping, wrestling, swimming, and the throwing of various missiles, such as the javelin and the discobolus. At a somewhat later period the javelin-throwing was discontinued, and a new sport, called the 'pancratium,' a combination of boxing and wrestling, substituted.

The ancient German race (50 B.C.), was, as now, noted for its love of manly exercises—leaping, running, wrestling, putting the stone, etc., which are mentioned in the *Nibelungentied*; and there, as also somewhat later in Britain, the cultivation of strength, the performance of manly deeds, and the various acts of knightly prowess were continued down to the end of the middle ages. From this time onwards the attention paid to athletic exercises decreased in Britain and Europe generally. During the 17th and until the end of the 18th century, fencing was the only exercise worthy of the name.

In 1762 Rousseau (in *Emile*) succeeded in arousing some interest in the subject; but the real revival of practical gymnastics took place in Germany about 1811, when F. Ludwig Jahn established numerous *Turnplätze*, or gymnasia, at Berlin, which became extremely popular among the youth of the country. In 1813 Sweden followed the Prussian example, and established gymnasia under Ling, and since that time physical training has formed a prominent item in the Swedish educational curriculum. Public attention was again attracted to the subject in France in 1843, but not until 1839 were any practical steps taken to make gymnastics a real part of education. Belgium and Italy also adopted more or less systematic methods of gymnastic training in their schools and armies about this time. In England, until 1858, gymnastics proper received but scant attention, boxing being the chief exercise of the upper classes in the first half of the

19th century. In the year named, however, Amherst College built a gymnasium; and so marked were the effects of the training upon the physique of the students, that the military authorities at last moved in the matter. In 1860 an officer (Major Hammersley) and some ten or twelve men were sent for training to MacLaren's gymnasium at Oxford. From this time onwards the military authorities have improved and extended their system. At every large military station there is a gymnasium, at which every man has to undergo a course of training.

Modern gymnastics do not include athletic exercises, such as running, rowing, swimming, skating, or, in fact, any outdoor exercise; but fencing, boxing, and high jumping are usually considered to be items in a complete gymnastic training.

Gymnastic exercises may be broadly divided into three groups:—(1.) Free movements of the body without fixed apparatus, which are, generally speaking, adaptations of the Swedish system of Ling. They include exercises with dumb-bells and bar-bells, as well as movements without weights or hand apparatus. Indian club exercises also come under this heading. (2.) Pure gymnastics, with the use of heavy apparatus, such as the horizontal bar, the parallel bars, the pair and row of rings, the vaulting horse, the trapeze, the climbing rope, and jumping apparatus. (3.) Antagonistics—boxing, fencing, singlestick, quarter-staff, and sometimes wrestling. Weight-lifting, too, has latterly been introduced into some of the international gymnastic competitions. To produce the best results, especially in the young, the exercises must be carefully graded, and accurately suited to the physical capabilities of each pupil. In 1902 a royal commission was appointed to inquire into the existing opportunities for physical training in schools in Scotland, and to suggest means whereby these opportunities might be improved. In the United Kingdom gymnastic competitions are annually held under the guidance of the 'Amateur Gymnastic Association.' See MacLaren's *Physical Education* (1895); Schmidt and Miles's *The Training of the Body* (1901); Seymour's *Physical Training: its Theory and Practice* (1898); Jenkin's *Gymnastics* (1890).

Gymnema, a genus of evergreen tropical climbing shrubs, of which *G. lactiferum* is valued by the Sinhalese of Ceylon for the milky juice which it yields. The *Gymnemas* can be grown in a warm house in a peaty soil.

Gymnocladus, a genus of plants composed of two species of leguminous trees. *G. canadensis*, the so-called Kentucky coffee-tree, is a graceful tree bearing white flowers in May, followed by reddish-brown pods, which remain suspended from the leafless branches all the winter. In rich, moist soil it may easily be grown in Britain.

Gymnolomia, a genus of Central American composite plants, which are grown as half-hardy perennials in Britain. They mostly bear large yellow flower heads in summer or autumn.

Gymnosophists, a sect of Hindu philosophers who wore no clothes. They were distinguished from other sects more by their ascetic lives than by their doctrines, that of metempsychosis being the basis of their belief. They came after Alexander's time to Egypt and Ethiopia, where they established schools.

Gymnospermæ, one of the main subdivisions of flowering plants. It is separated from the other great division, the Angiospermæ, by the fact that in the former the pollen, instead of being received on a special organ—the stigma—is received direct into the micropyle of the ovule, the ovule being exposed on scales. The pines and cycads belong to this division.

Gymnostachys, a one-species genus of plants belonging to the order Aroidaceæ. *G. anceps* is an Australian perennial grown under glass, in a peaty soil, in Britain. It bears spikes of white flowers in summer. Propagation is effected by means of suckers and divisions.

Gymnostachyum, a genus of evergreen E. Indian herbaceous plants belonging to the order Acanthaceæ. They bear spike-like racemes of flowers, usually small, but of much beauty.

Gymnotus. See ELECTRIC EEL.

Gympie, a gold field and town in Queensland, Australia, 107 m. by rail N. of Brisbane. Gold was first found in 1867 by Nash. Since then to 1900 the yield has been about 2½ million oz. Pop. (1901) 11,959.

Gynecology, that branch of the teaching of medicine which deals with the diseases peculiar to women. It of course excludes obstetrics.

Glycerium, a genus of American grasses, with dioecious flowers. The Pampas grass, *G. argenteum*, is an important garden plant, with tall flower-stalks, surmounted by beautiful silky panicles, making it a valuable decorative object in front of a shrubbery or other situation. It likes a light, rich soil.

Gynophore, in botany, a prolongation of the flower-stalk, or thalamus, beyond the calyx, forming a stalk or covering for the ovary. The pink and the passion flower afford examples.

Gynura, a genus of tropical composite plants, some of which are cultivated as stove plants in Britain. They like a light, peaty soil.

Gyoma, tn., co. Bekes, Hungary, on the White Körös, 110 m. by rail S.E. of Budapest. Pop. (1900) 11,541.

Gyöngyös, tn., co. Heves, Hungary, 64 m. by rail N.E. of Budapest; makes good wine. Pop. (1900) 13,878.

Győr, Hungary. See RAAB. **Gyp**, pseudonym of GABRIELLE SYBILLE MARIE ANTOINETTE RIQUETTI DE MIRABEAU, COMTESSE DE MARTEL DE JANVILLE (1850), French novelist, born in Morbihan, castle of Koëtsal; is connected by descent with the famous Mirabeau. In 1882 she published *Petit Bob*, which has run through forty editions. Her other famous novels, most of which have been translated into English, are *Autour du Mariage* (1883; over ninety editions); *Ce que Femme veut* (1883); *Autour du Divorce* (1886); *Made-moiselle Eve* (1895); *Bijou* (1897); *Trop de Chic* (1901); *Clocto* (1905). 'Gyp' excels in describing the life of the money-worshipping aristocratic society of Paris; her dialogues are bright and witty. She has taken part in the Anti-Semitic movement.

Gypsies. The name Gypsy, formerly Gypeyan or Gypitan, is a corruption of Egyptian, as are also the variants Gypiten (France and Belgium), Gyptenaar (the Netherlands), and Gitano (Spain). All these forms indicate the country whence these people were supposed to have come—Egypt, or more frequently 'Little Egypt.' This, however, was by no means their only designation. In Spain they were known besides as New Castilians, as Germans, as Flemings, as Greeks, and as Bohemians. Those of south-western France were Cascarrots and Biscayans, and in France they were also Bohemians and Saracens. English instances of the application of Bohemian-Tartar and High German to people who were apparently Gypsies are cited by F. H. Groome; and in Scotland there is mention of 'Gypsies or Saracens,' otherwise 'Moors or Saracens,' the period of whose presence in Scotland was the 15th century. In Poland they have been styled Szalassi, Philistines, and Cygani; this last word assumes also the forms Zigani (Russia), Czigani (Hungary), Zigeuner (Germany), Ciganos (Por-

tugal), Tsiganes (France), Cingani or Acingani (Corfu), Zingari (Italy), Zineali (Spain), and Tchingham (Turkey). They have been frequently styled Tartars, notably in Scandinavia, where they are also called Fante-folk. Heiden (i.e. 'heathen') appears to have been alternated with Egyptian in the Netherlands, although Dirks has expressed his conviction that the earliest 'Heiden' references relate solely to non-Gypsy people in Prussia and Livonia. The appellation Greek appears to have been given to Gypsies in the Netherlands and in Scotland. Some of these names—such as German, Fleming, Bohemian, and Greek—seem merely to denote the country whence they happened to come at certain periods; probably because the laws of that country were then specially adverse to them. Their own self-applied name of Rom, Roum, or Romano (pl. Romi and Romané, or Romany) signifies 'a gypsy man;' but it is important to note that Rom or Roum was at one time equivalent to the Byzantine empire, and the wine called Romany received its name because it comes from Greece. This is all the more noteworthy when we find it stated that 'Little Egypt,' the alleged home of the Gypsies, was really Epirus, 'commonly called Little Egypt.' Such is the testimony afforded by two writers of the 16th century, quoted by Bataillard, with reference to the Gypsies who came to Strassburg in 1418. Bataillard further cites Mazaris, a Byzantine author, who, writing in the year 1416, says that at that date the Peloponnese was inhabited by 'seven principal nations,' of whom one was that of the 'Egyptians.' The French *Tsiganologue* also compares these statements 'with what we already know from Hopf and other sources of the existence of Gypsies in various parts of Greece in the 14th century and at the beginning of the 15th; not forgetting the deductions which Miklosich has drawn from the study of the Gypsy dialects, relative to their long stay in that country before the 15th century;' and he finally notes 'that Guphtoi is still at the present day one of the names given to the Gypsies in Greece, where certain ruins are known as Guphto-Kastron' (Gypsy castles). The acceptance of this locality as Little Egypt is quite in consonance with the repeated assertion of the 15th-century Gypsies that they had been driven from their country by the Turks, for it was in the 15th century that the Turks became masters of the Morea and Epirus; and Grollmann points out that the Turkish sultan

Ahmed IV. styled himself 'King of the Greater and Lesser Egypt.' The accuracy of this reference has been questioned, but Thewrewk de Ponor cites a document of the Bartfeld (in Hungary) archives wherein there is undoubted mention of 'Great and Lower Egypt.' Thus, when in the *Constitutions of Catalonia* (1512) the Gypsies are described as Greeks, as well as Bohemians and Egyptians, that simply means that the people alluded to were Greek Gypsies, who continued to dwell in Greece under Turkish rule. This view is borne out by the statement of a 16th-century Spaniard, quoted by Borrow, that 'a learned person, in the year 1540,' spoke to certain Gitanos 'in the vulgar Greek, such as is used at present in the Morea and Archipelago,' and, adds the Spanish writer, 'some understood it, others did not.'

At this point De Goeje's statement as to the advent of Gypsies in Europe may be suitably introduced. That Arabic scholar points out that the name Luri, given to the Persian Gypsies, is equivalent to the Arabic Zotti, or Jat; that a Persian king (Behram Gur) brought 12,000 of those people from India into his country in the 5th century; that such deportations were repeated in later times; that, after subsequent settlements in the Tigris valley, they were brought westward to the frontier of the Byzantine empire; that in 835 the Byzantines made a successful invasion of Syria, and brought back 27,000 Jat prisoners, with their domesticated buffaloes and other goods; and that 'thus did the first bands of Gypsies come into the Greek empire.' There is much to be said in favour of the deduction. The domesticated buffalo is still seen drawing the carts of the Roumelian Gypsies; and the Gypsies have everywhere been famous for their musical gifts, which formed the chief attraction of the 5th-century Luris or Jats in the estimation of the Persian monarch. The fact that the modern Jats of Hindustan do not speak the language of the Gypsies no doubt requires explanation; but the genealogy outlined by De Goeje seems very clear and distinct. Nevertheless, Bataillard's contention that these Jats merely formed an accession to a previous Gypsy population in Europe is equally worthy of consideration.

There are many indications of the existence of Gypsies in Europe during the middle ages. In 1122 an Austrian monk described them, under the name of 'Ishmaelites,' as 'travelling far over the world.' An edict issued by King Boleslas V. of Poland in

the year 1256 calls them Szalassi; and Zielinski explains that Szalassi (? tent-people) denoted Gypsies throughout the 12th and 13th centuries. It is asserted on fairly good evidence that there were Gypsies in Alsace about the year 1270, and in Westphalia before the end of the 14th century. But one thing clear is that they came into special prominence during the 15th century. In 1417 a company of them, travelling on pilgrimage as Christian penitents, received letters of protection from Sigismund, emperor of Germany, at Lindau, on the Lake of Constance. The same monarch again, when at Zips in Northern Hungary, in April 1423 granted a letter to 'our faithful Ladislas, count [voivode] of the Cigani, with others of his tribe,' wherein the authorities in Sigismund's empire are commanded to show every favour to Ladislas 'and the Cigani who are subject to him;' it being expressly stipulated that, 'if any variance or trouble occur among them, then neither you nor any of you, but the said Count Ladislas, shall have the power of judging and absolving.' Previous to this, in 1417, a Gypsy company travelling through Hanover, Holstein, and Mecklenburg 'were bearers of and exhibited letters of protection (*litteras promotorias*) from several princes, amongst others Sigismund, king of the Romans; which caused them to be well received by the episcopal towns, by princes, castellans, fortified towns, and by bishops and other mitred dignitaries.' The presence of 'Duke Michael of Egypt,' with a following of earls, lords, and knights, is recorded in Switzerland in 1418; and 'the Lord Andreas, duke of Little Egypt,' visited Macon in 1419 and Deventer in 1420. 'Sir Miquiel, prince of Latinghem in Egypt,' with other 'Egyptians,' was present in Hainault in 1421; and 'Thomas, earl of Little Egypt,' arrived at Amiens on Sept. 27, 1427, bearing letters from the Pope (Martin V.) certifying that he and his followers had been driven from their country for not having consented to forsake the Christian faith. The leader last named is not unlikely the same as the subject of the following entry in the municipal accounts of Utrecht in October 1429:—'Given to the duke of Lower Egypt [Neder-Egypten], who had come into our town with the Heidenen [i.e. Gypsies], having a written permission from the Pope to visit the Christian land, iv. pots of wine'—valued at four livres sixteen schellings. In the following month he appears to have been at the town of Arnheim in Guelderland, whose records thus

chronicle his visit:—*Item*: on the eve of St. Andrews, to the count of Little Egypt [*den Greve van Klijn-Egypten*], with his company, to the honour of God, vi. Arnheim guildens. *Item*: to the same count and to the heathen women, to the honour of God, a half-malder [a corn measure] of white bread.... a barrel of beer.... [and] a hundred herrings.' And it is evidently the same count or duke (*hertoghe*) of Little Egypt with regard to whom the archives of Middelburg, near Flushing, state that on Feb. 21, 1430, he 'had come here to receive alms, having letters from the Pope, which allow him to travel over the land for five years;' whereupon he was paid twenty schellings from the public purse. In the following January, Middelburg also paid three Burgundian guildens to the *hertoghe van Egipten*, 'because he was the bearer of letters from our gracious lord of Burgundy [Philip].' Twenty years later the Gypsies stabled their horses in the high school of Middelburg. So that it is no wonder that, in 1460, the authorities sent ten schellings to 'Constantine, count of Egypt, then at [the neighbouring town of] Goes, with a company of Greeks, in order that they may not come here [to Middelburg].' In February 1524 'Sebastian Faisan and Baron Wiltosia Gypsies [*Gypsenars*]' were banished from Middelburg for three years on account of their riotous conduct. There are many Gypsy entries in the Dutch records. Zutphen bestowed alms on certain 'Gypsy lords' in 1445, and again on 'the king of Little Egypt' in 1459. The town of Deventer gave much money and food, in 1420, to Lord Andreas, duke of Little Egypt, who came thither with a hundred followers—men, women, and children—and about forty horses. This leader also showed a letter from the king of the Romans (Sigismund), asking that alms be given to him. And he also stated that he had been driven out of his country for professing the Christian faith. During their stay the Gypsies occupied the *want-huis*, a building evidently reserved for them, as this and successive entries denote. Molhuysen identifies this with the *Heidenshuis* (i.e. Gypsy house), in a well-known alley in the town. Here 'the people of Little Egypt' lodged in 1429. In 1438 Deventer paid fifteen guildens to 'the king of Little Egypt, with his company,' and again twelve guildens in 1439 to 'the duke of Egypt, with his people, who lodged in the *want-huis*;' while in 1441 'the king of the heathens, with his company,' received ten guildens. In 1445 the burghers

of Deventer, like those of Middelburg in 1460, sent money to the Gypsies on condition that they did not come to their town. One other reference may be selected from the numerous notices of Gypsies in the Netherlands. This was a letter of protection granted in 1496 by Charles, Count of Egmond, under his privy seal, to 'Count Martin Gnougy, born of Little Egypt,' couched in similar terms to those given to Gypsy chiefs by Sigismund and the duke of Burgundy. It is stated in this letter that the Pope (Alexander VI.) had ordained Count Martin and his family and company 'to go on pilgrimage to Rome, to St. James of Galicia, Compostella, and to other holy places;' and to further this purpose, the Count of Egmond strictly commands all his representatives throughout his principality to succour and protect 'the foresaid Count Martin, his family and company, with their goods, animals, gold, silver, etc.' wherever they may go, but with this reservation, that the Gypsies do not stay longer than three days in one place—a stipulation, be it noticed, still in vogue in some countries.

Here, again, we have the Gypsies recognized as Christian pilgrims; nor are such instances exceptional. In spite of the fact that the name 'Heathen' was used in at least one country as a synonym for 'Gypsy,' the 'Egyptians' of the middle ages are described again and again as professing the Christian faith. Eloquent testimony to this fact is furnished by the Swabian chronicler who records how, in the year 1445, 'on St. Sebastian's even, there died the high-born lord Lord Panuel, duke [*herzog*] in Little Egypt, and lord of Hirschhorn in the same land;' and further, how at Pfortzen, in 1498, 'there died the well-born Lord John, Free Count [*Freygraf*] out of Little Egypt, to whose soul may God be gracious and merciful' (*Annales Suevici*, Frankfurt, 1596, ii., pp. 384 and 510). Emblazoned on the tomb of Lord Panuel are his arms—a yellow eagle crowned, and for crest, above a crowned helmet, a stag horn erect.

In all this there is nothing surprising, when it is understood that in some countries—probably in all—the local ruler of the Gypsies was not of Gypsy race. Zielinski states (1890) that the Gypsies of Poland and Lithuania, during the 16th century and subsequently, were ruled over by a 'king [or regent] of the Cygans,' who was selected from among the Polish nobility, and received his appointment from the chancellor royal. Emil Thewrewk de Ponor, writing (1888) of his own country,

informs us that 'the Gypsy captaincy was vested in the nobility of Transylvania and Hungary. The voyvodeship, or captaincy of the Gypsies,' he continues, 'has long been with us an office of state, combined with which were "*cura prerogativa, fructus et emolumenti*," which the crown bestowed on distinguished persons as a reward of merit, but not on Gypsies. In Transylvania we find sometimes one, sometimes two, such captaincies. In Hungary there have been four—one on each side of the Danube, and one on each side of the Theiss.' It may thus be safely inferred that the Emperor Sigismund's letter of 1423, granted to 'our faithful Ladislus, count of the Cigani,' was not granted to an alien, but to one of his own subjects. It is not likely that Hungary and Poland differed from other countries in this respect. In Corfu, as Colocci points out, there was a fief or barony of the Cingani, held by successive Venetians during the 15th, 16th, and 17th centuries; and he cites a document of as recent a date as 1692, which was issued by a Venetian baron, '*Giudice e Capitano delli Acingani*'—i.e. of the Gypsies of Corfu.

A similar instance is discernible in Scotland. There the position of the Gypsies appears to have been the same as in other countries. The lord high treasurer's accounts show that the king (James IV.) paid fourteen shillings to an 'earl of Greece' in May 1502, and seven pounds to a 'knight of Greece' in the following month, while in April 1505 he disbursed seven pounds 'to the Egyptians.' In July 1505 he wrote a letter to his uncle, King John of Denmark, commending 'Anthonius Gagino, a count of Little Egypt, who, with others of his company, was, according to their custom, making a pilgrimage through Christendom;' which letter was duly delivered, and is preserved in the royal archives of Denmark. On May 25, 1530, forty pounds were paid by James V. 'to the Egyptians that danced before the king in Holyrood House.' About the year 1539 he granted letters under his great seal to 'our lovit [*beloved*], a term in Scottish law used to denote a loyal subject] John Faw, lord and earl of Little Egypt,' wherein all the officers of the law throughout Scotland are commanded to assist the Gypsy leader 'in execution of justice upon his company and folks conform to the laws of Egypt;' an injunction similar to that contained in Sigismund's letter to 'our faithful Ladislus, count of the Cigani,' in 1423. This mandate of 1539 was fol-

lowed and reinforced by a Privy Council writ, signed by the king in February 1540, wherein it is stated that 'Sebastian Lalow, Egyptian, one of the said John's company, with his accomplices and partakers under written.... rebel and conspire against the said John Faw, and have removed themselves utterly out of his company, and taken from him divers sums of money, jewels, clothes, and other goods, to the quantity of a great sum of money, and in no wise will pass home with him.' The writ goes on to say that, in opposition to the tenor of a bond executed by Sebastian before the master of the king's household, 'the said Sebastian, by sinister and wrong information, false relation, and circumvention of us [King James V.], has purchased our writings discharging him and.... his accomplices and partakers of the said John's company, and with his goods taken by them from him causes certain of our lieges to assist them and their opinions, and to fortify and take their part against the said John, their lord and master, so that he in no wise can apprehend or get them to have them home again within their own country, after the tenour of his said bond, to his heavy damage and scathe, and in peril of loss of his heritage, and express against justice.' Thereupon the writ charges all the sheriffs, provosts, etc., in Scotland to use every effort to apprehend the rebels 'and bring them to him [this earl of Little Egypt] to be punished for their demerits conform to his laws.... and to that effect lend to him your prisons, stocks, fetters, and all other things necessary thereto, as ye and each one of you, and all others our lieges, will answer to us thereupon, and under all highest pain and charge that after may follow, so that the said John have no cause of complaint hereupon in time coming, nor to resort again to us to that effect.' The writ further charges 'all our lieges that none of them molest, vex, inquiet, or trouble the said John Faw and his company in doing of their lawful business, or other ways within our realm, and in their passing, remaining, or away going forth of the same, under the pain above written.' This writ teems with considerations which cannot be discussed here, but it reveals the commanding position occupied by 'Egyptians' four centuries ago; and it shows that, although they were regarded as foreigners, yet they constituted an *imperium in imperio* in Scotland as in other countries. This is further seen from a document issued under the privy seal of Scotland in May 1540, delegating

full justiciary powers over his own subjects to 'John Wanne, son and heir of John Fall, lord and earl of Little Egypt, and master of the Egyptians dwelling within the kingdom of Scotland.' The surname Fall or Faw was also borne at this time by 'Earl George called of Egypt,' who figured at Aberdeen on Jan. 22, 1540. And the family so named became identified with the Gypsies of the south of Scotland and the north of England in later times. Nevertheless, the name does not appear to be of Gypsy origin, and it is quite likely that 'our lovit John Faw' was of Scottish birth. From this incident of 1540, as from other references on the Continent, it is clear that the 'Egyptians,' while closely interlinked with the various nations of Europe, constituted a separate polity, and even possessed a country of their own. In the Scottish writ of 1540 it is explicitly stated that the earl of Little Egypt 'is bound and obliged to bring home with him all them of his company that are in life, and a testimonial of them that are dead.' Moreover, a later document shows that the outcome of the dispute between him and his recalcitrant followers was that it was 'agreed among them to pass home and have the same decided before the duke of Egypt.' Again, there is an instance of one of the followers of Jean Charles, a French Gypsy captain of the 16th century, who, at the foot of the gallows, 'appealed to the king of Little Egypt,' thus carrying his case to a higher court. Further statements point in the same direction. Thus, the Egyptians who visited Tournai in Hainault in 1422 'had privileges, so that none could punish them save themselves.' Duke Michael's company, when in Switzerland in 1418, are stated to have had 'a great deal of gold and silver, provided by their own country, which they lavishly expended.' And an English writer of 1542, Dr. Andrew Boorde, says of the Gypsies: 'Their money is brass and gold.' All such references plainly imply a distinct nationality. But the end of the 15th century marks the beginning of the decay of 'Little Egypt' with its peculiar privileges and power; and from that time onward, with little intermission, the European states concurred in issuing edict after edict by which the Egyptians were doomed to persecution, banishment, and death. A decree issued in 1499 by Ferdinand and Isabella of Spain forbade them to remain within that country, except under certain severe restrictions; and all previous statutes in their favour

were revoked. In 1500 Maximilian I. ordained their expulsion from the whole German empire. In 1504 the Gypsies of France were ordered to leave the kingdom or go to the galleys; although the ineffectiveness of this edict may be gauged from one issued by Francis I. in 1539, wherein the Gypsies are still described as wandering about 'under cover of a simulated religion and of a certain penitence.'

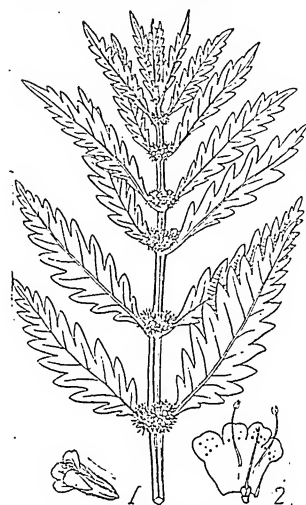
The term 'simulated' is significant, because in the previous century the Gypsies were actually recognized as religious pilgrims, without any 'simulation,' by popes, bishops, and princes. This circumstance, which is apparent from many of the foregoing citations, is even more clearly shown by two Hungarian references of 1417-18. The first is an entry in the household book of a Hungarian magnate, recording the gift by him of forty sheep 'to the poor pilgrims out of Egypt, so that they, returning to Jerusalem, may pray for the health of our souls.' The other instance is a gift by the Count of Herrmanstadt of food 'to the people from the Holy Land,' with fodder for their horses. Both references are rightly regarded by Von Wlislocki as indicating Gypsy bands (*Vom wandernden Zigeunervolke*, 1890, pp. 12-14). It seems clear that the explanation of the political position then occupied by the Gypsies must be sought in the situation previously created by the crusaders, and especially by the pilgrim fraternities of the Templars and the Hospitaliers. Thus 'Egypt,' or 'Little Egypt,' seems to have been a mediæval folk-name denoting primarily Syria, and afterwards Greece, Rhodes, Cyprus, and Malta. The shadowy titles borne by the 'Egyptian' leaders, who were often of European race, are counterparts of those borne by the landless lords of Rhodes. Some of those leaders were no doubt semi-gypsies by blood—the *barons mêtis*, or half-caste lords, of the French crusaders. The privileges accorded to 15th-century 'Egyptians' by the various European powers would be amazing and inexplicable were it not a matter of history that these privileges had existed for centuries before, for the benefit of pilgrims wandering to and from the Holy Land. That these 15th-century pilgrims were for the most part people of the well-known swarthy Gypsy type seems certain; and here Professor De Goeje's story of the Jat immigration in the 9th century deserves close consideration. One great stumbling-block, however, is that Jatiki (the Jat language

of to-day) differs from the Gypsy or Romany language, which has strong affinities with Hindustani. These linguistic and ethnological questions are pregnant with matter for discussion. It need only be added that after the 15th century the Egyptians' lost more and more of their political influence; and, deprived of it, their right to live upon others degenerated into 'masterful begging.' Many of them travelled in bands as mercenary soldiers, while others lived by trade as horse-dealers, peddlers, and tinkers; and each succeeding century shows them becoming less and less important in the eyes of Europe. See Pott's *Zigeunersprache* (1844-5); various works on the Gypsies by James Simson; Leland's *The Gypsies* (1882); Groome's *Introduction to his Gypsy Folk-Tales* (1899); the *Journal of the Gypsy Lore Society* (3 vols. 1888-92); Watts-Dunton's *Aylwin*; and Borrow's autobiographical novels.

Gypsophila, a genus of hardy herbaceous plants, belonging to the order Caryophyllaceae. They bear their small flowers in graceful panicles, and like a light soil and sunny situation. The annual *G. elegans* is exceedingly light and graceful, and very useful for lightening flowers of richer or more gorgeous hue.

Gypsum, a mineral (h.=2) consisting of calcium sulphate with combined water ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), which crystallizes in large and perfect crystals, or in cleavable masses. These are known as 'selenite,' and resemble mica in the perfect smoothness of their surfaces, and the great facility with which they can be split into thin, transparent plates. It is used to some extent in optical apparatus, and in making preparations for examination in polarized light. The name gypsum is often reserved for the fibrous and granular varieties, which occur in beds, veins, or concretionary lumps. They are commonly associated with rock salt and magnesian deposits, as, like these, they are due to the concentration of saline waters by evaporation. Much gypsum is found in the salt measures of Cheshire, and in the red rocks of the midlands and north of England; and it is deposited in large quantities in the Great Salt Lake of Utah. Gypsum may be pure white, and when it is fibrous is often satiny, being known as 'satin-spar;' but it may be red or yellow, from the presence of ferruginous staining matters. Pure coloured granular massive gypsum is alabaster, and when snowy white and perfectly homogeneous is carved into boxes, vases, statuettes, and ornaments. Gypsum, when

burned, is converted into plaster of Paris, and is used also to improve the soil of fields, and in the manufacture of pottery and of certain kinds of glass.



Gypsy Wort.

1, Single flower; 2, corolla laid open.

Gypsy Wort, the popular name given to the labiate genus *Lycopus*. *L. europaeus* is a native British aquatic plant, with dentate leaves and pale-pinkish flowers, borne in axillary whorls.

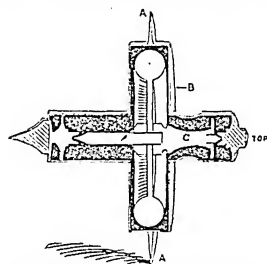
Gyrost and **Gyroscope**, names given to certain scientific forms of spinning top, intended to illustrate the properties of rotating bodies. When a body symmetrical about an axis of figure is set rotating about that axis, the tendency is for the axis to retain unchanged its directional position in space. For example, a well-thrown quoit passes through the air with its axis of rotation always pointing in the same direction.

The dynamics of a spinning top is best considered by first forming a clear conception of the dynamical property known as the moment of momentum or the angular momentum. This is the product of the momentum (mass \times velocity) into the distance from the axis. In the case of a number of particles building up a rigid body, the velocity of any one is measured by the product of its distance from the axis of rotation and the angular velocity of the rotating body. Hence the moment of momentum of mass m at distance r from the axis of rotation is measured by the quantity $mr \cdot r\omega = mr^2\omega$, where ω is the angular velocity of the body. Summing this quantity for all elements of the body, we get the moment of momentum of the

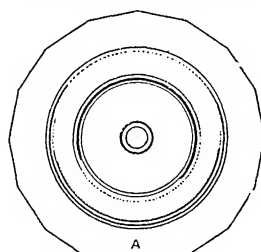
body, $\Sigma (mr^2) \cdot \omega$. This quantity has a direction, and is completely represented geometrically by a line drawn along the axis of rotation, and with its length drawn to scale so as to represent the magnitude of the moment of momentum.

Now, just as force is measured by the rate of change of momentum, so moment of force or couple is measured by the rate of change of moment of momentum. Let, then, the vector line OA represent completely the moment of momentum of the rotating body, and let the acting couple act about the axis of rotation. If the couple acts in the sense of the rotation, the moment of momentum will increase second by second at a rate numerically equal to the couple, so that in the geometrical representation A will move outwards along the direction OA , reaching the point A' in one second of time if AA' is the measure of the couple. If the couple acts about an axis not parallel to OA , the same vectorial construction will hold. Thus, if AA' is the couple, OA , the original moment of momentum, will become OA' .

Let us apply this principle to the case of a top spinning counter-clockwise to one looking down from above. The couple is the



SECTION OF GYROSTAT SPINNING AND RESTING ON PROJECTING EDGE A. OUTER CASE SHOWN AT B. C SHAFT TO WIND STRING.



TOP ELEVATION WITH OUTER CASE REMOVED. ADJUSTING PROJECTING EDGE.

Gyrost.

moment of the weight acting through the centre of gravity G , with reference to the fixed point O . This produces a clockwise rotation in the plane of the paper,

and is by convention represented by a vector line drawn down through the paper. This is the quantity AA' already referred to. Hence A will begin to move away in that direction. In other words, the principal axis OA will describe a cone counter-clockwise as viewed from above. Consider again the balancing of a bicycle. Each wheel is a gyrostatis. Let the rolling motion be from the spectator, and suppose the cycle to be falling down towards the right. How will this be corrected? Evidently a moment of force must be applied so as to cause the wheel to rise. Now the vector representing the moment of momentum of the wheel will be

force acting always perpendicular to the direction of motion of a body has no effect on the rate of motion, but only on the direction, so, when a rotating symmetrical body is acted on by a couple whose axis is always perpendicular to the axis of rotation, there is change only in the *direction* of the axis, and not in the amount of the angular velocity.

The modern projectile shot from rifled ordnance is a gyroscope tending to preserve unchanged its original direction of axis of rotation. As a matter of fact, the projectile in its flight closely approximates to the tangent of the curve of flight or trajectory. This shows that if

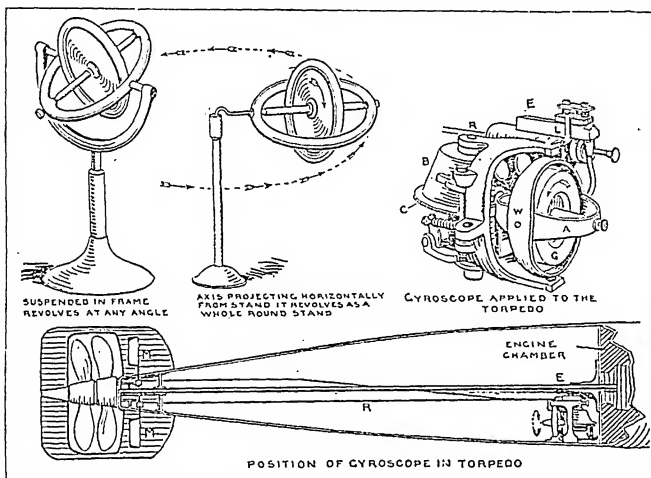
the course on which they have been discharged, and for correcting any tendency to lateral deviation. In this connection the appliance is originally the invention of L. Obry of Trieste, sometime of the Austrian navy. The action depends on a rapidly revolving wheel, with a weighty periphery, suspended in gimbal rings in such a manner that friction is reduced to a minimum. According to a well-known law, the axis of the wheel tends to maintain itself in the original direction in which it was when the rotary motion was imparted to it. The gyroscope acts on the slide valve of a steering-engine, and upon any lateral movement of the torpedo from the initial direction the slide valve is affected, and works a piston connected with vertical rudders pivoted in the tail, thus immediately steering the torpedo back again into the original direction of the line of fire. The higher the rate of revolution of the wheel, the greater the tendency of the apparatus to remain in correct adjustment. Motion is given to the wheel at the moment of discharge by the rapid unwinding of a torsional spring. The weight of the apparatus is between 8 and 9 lbs., and the machine is placed in the buoyancy chamber of the torpedo. The course of the torpedo with the apparatus in action is of a lateral wave form, with ordinates of a maximum of about two metres in length. By the use of the Obry gyroscope torpedoes can be set to run accurately up to 2,000 yards, though at decreasing rates of speed. See TORPEDO.

A somewhat similar apparatus is also used in the working of the 'Beauchamp-Towers steady platform' for the mounting of small quick-firing guns and searchlights on board ship. In this case the rotation of the wheel, which is horizontal, is started and preserved by means of steam. Something of the same sort, for the support of an astronomical telescope at sea, was devised and used by Professor Piazza Smyth as early as 1856.

Gythium, anc. seapt. of Laconia, Greece, on the Gulf of Laconia; was the station of the Spartan fleet, and suffered severely during the Athenian wars. Most of the ancient city is now beneath the sea.

Gyula, tn., Hungary, chief tn. of co. Bekes, 64 m. by rail N.E. of Szegedin. Pop. (1900) 22,023.

Gyula-Fehérvár, Hungary. See KARLSBURG.



Gyroscope applied to the Obry Gear.

M, M, Rudder; R, steering rod; E, steering engine; C, gyroscope wheel; A, W, gimbal rings; N, chamber with spring, released on firing; G, toothed wheel causing the gyroscope to revolve rapidly; L, lever controlling valve of steering engine, its end holding a projecting pin on W. If the torpedo is deflected, the ring W, keeping its original direction, and acting on the lever L, steers it back to its original line of movement.

drawn towards the left as seen by the spectator. To bring this horizontal we must apply a couple whose axis AA' is downwards. Hence the rider must twist the handle round towards his right—i.e. towards the side on which the wheel is falling.

These are familiar examples of gyrostatic action. When a gyrostatis—which is simply a symmetrical rotating body enclosed in a case so as to permit of being easily handled—is subjected to various couples, the effects, though at first sight very extraordinary, can all be explained by the method given above. It will be easily seen that, just as a

the rifling is right-handed a couple must be acting in the projectile with axis downwards. Again, the phenomenon of the drift of the projectile to right or left of the original direction of projection, according as the rifling is right-handed or left-handed, shows that there must be a couple with axis in the direction in which the upper surface of the projectile is moving. These couples must be due to the effect of atmospheric pressure upon the projectile; but their origin is still somewhat of a mystery.

The gyroscope is applied in the navy as an apparatus for keeping automobile torpedoes on

H

H. In all languages this sound tends to become silent. The 'dropping' of *h*'s was as much a feature of Latin speech as it has been of English. Early in the 19th century English initial *h* was in course of being lost entirely. Its retention in writing, and its more general preservation in the English of Scotland and Ireland, have led to a reaction. *Herb*, *hospital*, etc., are now generally pronounced with *h*; even its revival in such words as *honour* is not improbable. Before words commencing with a vowel, in 'vulgar' speech *h* is employed to avoid hiatus or for emphasis (see Murray's *Dictionary*). 'Educated' people have set themselves against this also. In standard modern French all initial *h*'s are silent; the 'aspirate' *h*'s were the last to yield. In the early Semitic alphabet *h* was represented by *H*, and *H* stood for (German) *ch*, and perhaps also for a strong *h*. This distinction was not required in the Greek alphabet; *H* was devoted to the representation of *h*, and *E* was available for the vowel *e*. From the 7th century B.C. *H* also, in the Greek alphabet, gradually ceased to represent a consonant, and became a vowel sign, *η*. But before this it had passed to Italy with the value *h*, and so it came to Britain. In the early Semitic form there were three cross strokes. Hebrew *ח* has preserved only one; *h* and *η* are incomplete forms of *H*. The Semitic name *cheeth* means 'fence.'

Haag, CARL (1820), German painter, born at Erlangen in Bavaria; in 1847 he settled in London, and has been a constant contributor to the Royal Water-colour Society. In 1858 he was appointed court painter to the reigning Duke of Saxe-Coburg. He executed a number of pictures for Queen Victoria, illustrating her life in the Highlands. Bedouin life is his special study.

Haakon, or **HACO**, the name of several kings of Norway. **HAakon I.**, the **Good** (915-61), son of Harold Fair-Hair, passed his youth at the court of King Athelstan of England, returned (935) after his father's death to Norway, and dethroned his tyrannical brother, Eric Blood-Axe. He ruled well, kept the nobles in check, and was converted to Christianity. In 961 he was murdered by the sons of Eric. **HAakon V.** (1204-63), called the **Old**, son of Haakon IV., was recognized as king in 1223. A vigorous and enlightened ruler, he encouraged trade, and built churches

and ports. He gained (1241) the overlordship of Iceland. In his old age he undertook an expedition against Scotland in defence of the Hebrides, but was defeated at Largs (1263) by Alexander III., and died in the Orkneys on his way home. **HAakon VII.** (1872) was elected king by the Norwegian people in October 1905. He is the son of Frederick VIII., king of Denmark, and married in 1896 Maud Alexandra, daughter of Edward VII. His baptismal name is Carl.

Haarlem, tn. and episc. see of the Netherlands, chief tn. of prov. of N. Holland, 11 m. by rail w. of Amsterdam. The centre of the town is the Great Market, on or near which stand the Meat Hall (1602-3), the church of St. Bavo (15th century), the town hall (12th and 17th centuries)—with picture gallery (Frans Hals)—and the Teijler Museum (18th century). A new Roman Catholic cathedral has been erected. South of the town stretch the Frederik and Flora Parks, and the Haarlemmer Wood; in the first-named stands the Pavillon, containing a colonial museum (1871) and an industrial art museum (1877). Haarlem is famous for the cultivation of flower bulbs (narcissi, tulips, hyacinths, etc.). It also makes machinery and printers' type, carries on printing, bleaching, and brewing, and trades in cheese, butter, and cattle. Haarlem is the seat of a Jansenist bishop. In the 17th century it was the centre of a famous school of painting, to which belonged such men as the Wouwermans, Ostades, Frans Hals, Ruisdael, Everdingen, most of them natives. Here, too, Lourenz Coster, of printing fame, was born; and here the poet Bilderdijk is buried. Haarlem was long the residence of the counts of Holland. In 1573 it capitulated to the Spaniards. Pop. (1899) 64,079.

Haarlemmermeer, former lake of the Netherlands, between Haarlem, Leyden, and Amsterdam, measured 15 m. by 7. Drained in 1840-53, it now supports a population of some 16,500.

Habakkuk, one of the twelve 'minor' prophets of Israel, of whose personal life nothing certain is known. His book consists of a prophecy concerning the Chaldeans—i.e. the Babylonians (ch. 1, 2)—and a poem setting forth the divine majesty (ch. 3). The prophetic portion is of the nature of a dialogue or controversy between the prophet and God: when Habakkuk mourns the iniquities of his people, God points to the imminent vengeance

to be wreaked by the Chaldeans; and when the prophet protests against the employment of such an unworthy instrument, the answer is a somewhat elliptical declaration that, while the Chaldean will perish in his pride, the just Israelite shall live by his faith—i.e. his faithfulness, integrity. The lyric of ch. 3 (called a prayer, ver. 1) is believed by many critics to be by a later hand. The literary style of Habakkuk is forceful, graphic, and poetical; and his teaching reveals true moral and spiritual insight. His prophecy dates from about 600 B.C., shortly after the battle of Carchemish (604 B.C.). He is the subject of many Jewish traditions, the best known being that given in *Bel and the Dragon*, according to which he is carried by an angel to Babylon, that he may furnish Daniel with food. See Farrar's *Minor Prophets* (Men of the Bible, 1890); commentaries by Davidson ('Habakkuk' in *Camb. Bible for Schools*, 1877), Delitzsch (1843), Orelli (1893), Nowack (1901), G. A. Smith (*Expos. Bible*, 1895-8).

Habberton, JOHN (1842), American novelist, born at Brooklyn; connected with Harper and Brothers (1865-72); has been on editorial staff of *New York Herald* (1877), *Godey's Magazine* (1893), etc., and is author of *Helen's Babies* (1876), a story which had enormous success. Other works are: *The Barton Experiment* (1877); *The Jericho Road* (1877); *Other People's Children* (new ed. 1903); *The Worst Boy in Town* (1880); *Mrs. Mayburn's Twins* (1882); *All He Knew* (1890; new ed. 1900); *When Boys were Men* (1901); *The Tiger and the Insect* (1902). He also wrote a play, *Deacon Crankett* (1880).

Habeas Corpus, in English law, a prerogative writ obtained upon motion or demand from one of the judges, calling on a person holding the body of another in confinement to bring him up before the court, so that it may be determined whether the confinement was lawful or not. The court will then order immediate release or a speedy trial. The writ also issues to enable parents to obtain the custody of their children, husbands of their wives, etc. The writ includes aliens, but not alien enemies. An attempt to release Napoleon on *Habeas Corpus* in 1815 failed. The writ may be issued both at common law and under various *Habeas Corpus Acts*—of 1640, 1679 (which act is generally known as the *Habeas Corpus Act*, and refers to criminal commitments),

of 1803, and 1804 (which enables prisoners to be called as witnesses), of 1816 (which extends the writ to all illegal confinements, e.g. of lunatics), and of 1862 (which provides that writs shall not run in colonies which have a proper court). The writ is addressed to the jailer holding the person in confinement, who for disobedience may be punished by attachment; and it may be issued in vacation.

Habington, WILLIAM (1605-54), English poet and historian, was born at Hindlip, Worcestershire, and lived a quiet life of devotion to poetry and history. His verse is in the Caroline manner, but mainly devoted to the celebration of Lucy Herbert, daughter of Lord Powis, whom (c. 1639) he married. Poems: *Castara* (1634; eds. by Chalmers in English Poets, 1810; C. A. Elton, 1812; and E. Arber, 1870); *The Queen of Arragon, a Tragi-comedy* (1640; ed. H. H. Dodsley, 1876). Prose: *A History of Edward IV.* (1640), and *Observations on History* (1641).

Habit. Physiologically, habit is to be distinguished from the primary automatic actions, such as respiration, from reflex action and instinct, which are all inherited. (See **INSTINCT**.) The establishing of a physical aptitude or habit is really a selection of a few co-ordinated movements out of many irregular movements. Cycling at first involves irregular actions of the whole body; later these grow less, and on the acquisition of the art, narrow down to a few motions, most of which are carried on unconsciously. In the wide sense, all physical acquisitions whatever, other than those inherited, might be called habit; but ordinarily and more conveniently the term is applied to those actions of the individual that, beginning voluntarily or spontaneously or under excitement, are continued until they persist of themselves, thus being secondary automatic actions. Such actions imply in the central nervous system certain dispositions (Stout) as the result of function. Such dispositions are lying in wait until the circumstances inviting their action supervene. In other cases they determine the form of actions initiated by internal tension of the organism. Habits thus tend to become periodic, as the return of appetite at stated intervals, the waking at a fixed hour, and, in the larger cycle, the unrest or collapse on the recurrence of the holiday season. Habit is subject to organic rhythm. In the extreme form habit involves a certain dissociation of nerve functions. For example, the pianoplayer who carries on a con-

versation while yet proceeding unconsciously, or almost so, with his playing is not far removed physiologically from the automatic *planchette* writer, whose habits are entirely subconscious. Habitual actions may proceed in full consciousness, yet be entirely beyond modification by consciousness. Habits originating in cravings, as for alcohol or other drugs, are frequently of this order, and tend to become dissociated or morbid, being, as it were, organic fixed ideas.

Psychologically, habit means that mental functions once established become easier with repetition, are accompanied by feelings of familiarity, and gradually cease to be accompanied by any feeling of effort. Although conation, either as impulse or as conscious volitional effort, is usually prominent in the genesis of habit, habits may arise from exhaustions of, or shocks to, the nervous system, as is abundantly shown by the habits established in neurotic cases described by Pierre Janet and Raymond, the mode of origination being entirely unknown to the victim. The psychological 'law of habit' is of primary importance. All education depends on it. Both physically and mentally habit secures economy of effort. On the other hand, too, stable habits become a hindrance to new acquisitions, and growth thus is a perpetual struggle between the conservation of mental type and the readaptation of it by the incorporation of new elements. As age advances, habit predominates. The newborn child is all accommodations, the old man is all habits. Biologically, it has been held that habits are hereditary. This is not proven. The term habit is another name for modification, but may be a symptom of degeneration as well as of profitable adaptation. When attention is strongly absorbed, habits emerge into action; which shows that habits are part of the subconscious nerve-mechanism, and are ready to predominate whenever the inhibition due to direct cerebral supervision is relaxed. Hence the point of *in vino veritas*, alcoholic intoxication securing partial dissociation of consciousness. See **INSTINCT**; Baldwin's *Handbook of Psychology*, part iii. (1891); Stout's *Manual of Psychology* (1899); P. Janet's *L'Automatisme Psychologique* (1889), and (with Prof. Raymond) *Névroses et Idées Fixes* (1898).

Habit and Repute. (1.) In Scots law marriage requires no ceremony, but only the consent of the parties. If it is proved that a man and a woman live together, and that by habit and repute they are man and wife, the

Court of Session will give declarator of marriage in the absence of evidence to the contrary. (2.) It is by Scots law an aggravation of theft that the criminal is 'habit and repute' a thief—i.e. that he is commonly reported to earn his living by theft. The question is one for the jury. He must have borne that reputation for at least a year. Evidence of the police is sufficient.

Habitual Drunkards. See **DRUNKENNESS**.

Habsburg. See **HAPSBURG**. **Hachette and Company**, French firm of publishers and booksellers, established in Paris in 1826 by Louis Christophe François Hachette (1800-64). They published at first chiefly classical books, but since 1850 all sorts of books, and the *Paris Hachette*, a directory-guide to the French metropolis.

Hachioji, tn., Honshiu, Japan, 23 m. W. of Tokyo; a centre of silk industry. Pop. (1898) 23,203.

Häckel, ERNST. See **HAECKEL**. **Hackensack**, post vil., co. seat of Bergen co., New Jersey, U.S.A., 14 m. by rail N. by W. of New York. It is mainly a residential town, but has several silk mills, etc. Pop. (1900) 9,443.

Hackländer, FRIEDRICH WILHELM VON (1816-77), German novelist and comedy writer, was born at Burtscheid, near Aachen. He first made his mark with a study of military life, *Bilder aus dem Soldatenleben* (1841), followed by *Das Soldatenleben im Frieden* (1844; 9th ed. 1883). In 1849 he accompanied Radetzky on his Piedmont campaign, and wrote *Bilder aus dem Soldatenleben im Krieg* (Eng. trans. 1850). In 1859 he founded *Ueber Land und Meer*. The best of his longer novels are *Handel und Wandel* (1850; Eng. trans. 1867), *Eugen Stillfried* (1852); and his best comedies *Der Geheime Agent* (1850; Eng. trans. 1860), and *Magnetische Kuren* (1851). A collected edition of his *Werke* in 6 vols. was published at Stuttgart (1855-74). See his autobiography, *Der Roman meines Lebens* (1878).

Hackney, metrop. and parl. bor. of E. Middlesex, England, 3 m. N.E. of St. Paul's, London. The parl. bor. returns three members to Parliament. Formerly it was a fashionable residential village. John Howard, the philanthropist, was born here. Pop. (1901) 219,288.

Haco. See **HAAKON**.

Hadad. (1.) A descendant of Esau, who became king of Edom. He defeated the Midianites in the plain of Moab. (2.) An Edomite, who fled into Egypt to escape Joab. King David's commander-in-chief. Afterwards he became an enemy of Solomon (1 Kings 11:14 ff.).

Haddington, royal bur. and co. tn., Haddingtonshire, Scotland, 18 m. E. of Edinburgh; has grain markets and corn mills. It was for several years a royal residence. Alexander II. was born here in 1198, and John Knox (1505-72) is said to have been born near by. Its Abbey Church, the 'Lamp of Lothian,' dates from the 12th or 13th century. Jane Welsh, the wife of Thomas Carlyle, is buried in the choir. Samuel Smiles (b. 1816) was a native. Pop. (1901) 3,992.

Haddingtonshire, or **EAST LOTHIAN**, maritime co., Scotland, is bounded on the N.W. and N. by the Firth of Forth. The surface slopes from the Lammermuir Hills northwards, and is drained by the river Tyne. Several isolated trap hills are found, as Traprain Law, Garleton Hills, and North Berwick Law. The county has long been noted for the richness of its corn and root crops, being one of the best cultivated, not only in Scotland, but in Britain. Coal is mined in the west. Fishing is carried on. The county returns one member to the House of Commons. Pop. (1901) 38,665.

Haddock (*Gadus aeglefinus*), a member of the cod family, and the most valuable product of British fisheries. It is readily distinguished from the other species of the group by the large black spot on each side beneath the first dorsal fin, the black lateral line, and the position of the first ventral fin, which begins under the second dorsal. It occasionally reaches a length of about three feet, but is usually under two feet. As with most fishes whose eggs are pelagic, or buoyant, the females exceed the males in number (as 188 to 100), and the sexes are subequal in size. The food of the haddock consists of crustacea, mollusca, echinoderms, and worms, and it is very fond of the eggs of the herring. On the E. coast of Britain it spawns in February, March, and April, at a moderate distance from the coast, or near it if the water is deep; it also spawns on various banks in the



Haddock.

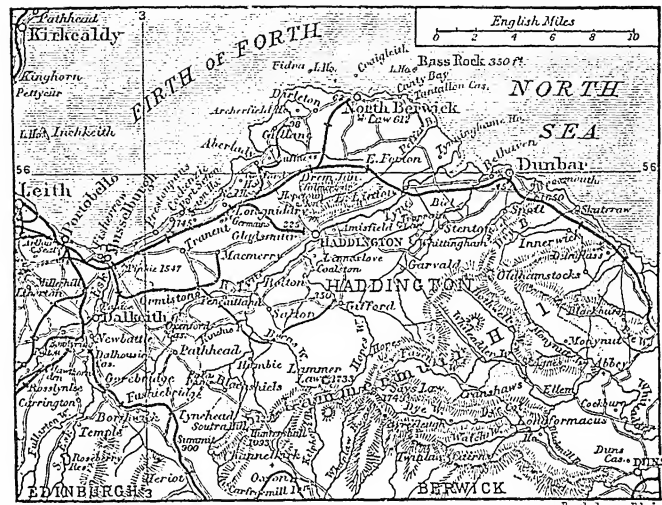
North Sea in deeper water. The female sheds from about 200,000 to 1,500,000 eggs, according to her size; they closely resemble those of the cod, but are a little larger, as is also the larval fish, which hatches out in from ten or twelve

to eighteen days after fertilization. The female reaches maturity when three years old and about fourteen or fifteen inches in length. The distribution of the haddock is from the Arctic seas to about the Bay of Biscay on the European coast, and to Cape Hatteras on the American side. The British catch amounts in value to about two millions sterling annually. The haddock is caught by small-lines, but principally by the otter-trawl. While large quantities are consumed fresh, it is also smoked on a large scale, especially as 'finmans,' named from Finnan, or Findon, in Kincardineshire, Scotland.

Haddon, **ALFRED CORT** (1855), English anthropologist, born in London. He was appointed to the chair of zoology in the Royal

Haden, **SIR FRANCIS SEYMOUR** (1818), English etcher, born in London. About 1858 he took to etching, and has done much towards its revival. Among his best-known productions are *Mytton Hall*, *Erith Marshes*, *Calais Pier*, and *the Breaking up of the Agamemnon*. His work is vigorous and spontaneous, rather than exquisite. He has written *Etched Work of Rembrandt* (1879), and *About Etching* (1879). He was the founder of the Royal Society of Painter Etchers. See Drake's *Catalogue of the Etched Work of F. S. Haden* (1880), and Wedmore's *Etching in England* (1895).

Hades, in Greek mythology, the god of the lower world; also called Pluto, Dis, Orcus, and Tartarus. He was the son of Chronos and Rhea, and brother



Haddingtonshire.

College of Science, Dublin (1880), in 1900 became lecturer in ethnology at Cambridge, and in 1901 was elected a Fellow of Christ's College, Cambridge. His works include *Introduction to Embryology* (1887); *Evolution in Art* (1895); *Study of Man* (1898); *Head Hunters*, *Black, White, and Brown* (1901), besides numerous papers and memoirs on anthropological subjects.

Haddon Hall, old English baronial mansion, dating from the 15th and 16th centuries, on the r. bk. of the Wye, 23 m. N.N.W. of Derby. It has been successively the seat of the Peverils, Avenells, Vernons, and the dukes of Rutland. A fine avenue of lime and sycamore trees still bears the name of 'Dorothy Vernon's Walk.' See G. Le Blanc Smith's *Haddon* (1906), and Scott's *Peveril of the Peak*.

of Zeus and Poseidon; his wife was Persephone. A staff was the symbol of his power, and he possessed a helmet which made the wearer invisible. In later writers his name is often used to denote the lower world. See **HELL**.

Hading, **JANE**, the stage name of **JEANNE ALFREDINE TRÉFOURET** (1850), French actress, born at Marseilles; was engaged (1879) at the Palais Royale, Renaissance, and Gymnase (1883), Paris. Under the directorship of Koning, whom she married (1884), she became one of the most famous *comédiennes* of her day. She accompanied Coquelin to America in 1894; created the part of Claire in Ohnet's *Maitre de Forges*, and that of Sapho in Daudet's play of that name, *Frou Frou*, Comtesse Sara, etc., and has acted in *The Second Mrs. Tanqueray* in London (1903).

Hadj, or HAJJ, the pilgrimage to Mecca. If possible, every pious Mohammedan performs this pilgrimage to Mecca once in his life. A representative may be sent, but he does not participate in the reward gained. The title of Hajji is thereafter adopted by

of the *Greek Language* (1869); *Philological and Critical Essays* (1873).

Hadley, JOHN (1682-1744), English mathematician and mechanician, in 1719 greatly improved the reflecting telescope, and in 1730 invented the reflect-



the pilgrim. At Mecca the pilgrim walks round the Kaaba or Black Stone seven times and kisses it, perambulates the graves of Ishmael and Hagar, visits the mountain of Arafat, and performs other rites. A similar pilgrimage to Jerusalem, undertaken by members of the Greek and Armenian Churches, confers the same title. See Burton's *Pilgrimage to El Medinah and Mecca* (1855).

Hadleigh, mrkt. tn., 10 m. w. of Ipswich, Suffolk, England. Pop. of par. (1901) 3,245.

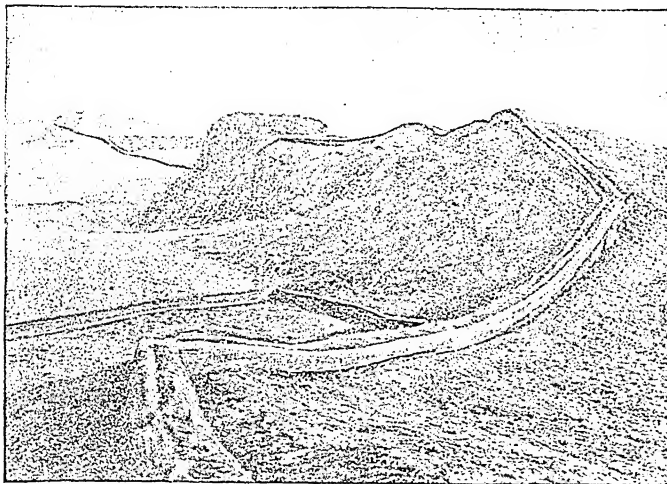
ing quadrant, which was modified into the sextant in 1759.

Hadramaut, or HADRAMUT, country of Arabia, whose arid coast extends from Oman to Yemen. The interior has fertile valleys. It has trade in myrrh, frankincense, aloes, carpets, shawls. The capital is Shibam; the chief port Makalla. The ancient Arabia Felix comprised Yemen and Hadramaut. Pop. 500,000. See T. Bent, in *Geog. Jour.* (1894), *Southern Arabia* (1900), and Landberg's *Hadramout* (1901).

Hadrian's Wall, stretching 73 miles from Wallsend on the Tyne to Bowness on the Solway, was built by command of the Emperor Hadrian, who visited Britain in 120. It was repaired by Severus in 209. The whole fortification consisted of a stone wall to the S., and a series of military stations and forts connected by roads in the intervening space. The stone wall, of great height and solidity, and strengthened by an enormous ditch running along its N. side, acted as a barrier against the Caledonian tribes; the huge earth-wall, fenced with stakes, was a defence against the constantly revolting tribes of S. Britain. See J. C. Bruce's *Roman Wall* (3rd ed. 1867), and *The Wall of Hadrian* (1874).

Hadrianus, PUBLIUS ÆLIUS (76 to 138 A.D.), usually called Hadrian, emperor of Rome from 117 to 138 A.D. He distinguished himself in the Dacian war, and in 108 was governor of Lower Pannonia; in 109 he was consul. In 117 he accompanied Trajan to the Parthian war; and when the emperor fell ill, he named Hadrian his successor. On his accession, Hadrian made peace with the Parthians, restoring to them Mesopotamia and Assyria; and also with the Roxolani, who had invaded Moesia; while Marcus Turbo pacified Mauritania. In 118 an unsuccessful conspiracy was formed against his life. In 119 he began his travels throughout the empire, which lasted the greater part of his reign. It was at this time that he visited Britain, and constructed the famous wall from the Solway to the Tyne. From 123 to 126 he lived at Athens, his favourite city, which he adorned with many buildings. In 130 his beloved companion Antinous perished on the Nile. After 134, Hadrian lived partly at Rome and partly at Tibur, where he built a magnificent villa. In his later years he is said to have been guilty of executing many distinguished persons whom he suspected. Hadrian showed great liberality to the provincials, and won their affection by making it clear that he regarded himself as emperor, not of Rome only, but of the Roman world. He was a patron of the arts, and devoted to poetry and philosophy. See Gregorovius's *Hadrian* (Eng. trans. 1898).

Hadrosaurus, a gigantic extinct fossil reptile, found in the Cretaceous strata of N. America, and closely related to the iguanodon. It belongs to the group of dinosaurs, and had a long massive skull, with numerous small teeth, which indicate that it was herbivorous.



Remains of Hadrian's Wall, Cuddy's Crag, near Borcovicus.
(Photo by Gibson & Son.)

Hadley, JAMES (1821-72), American philologist, was born at Fairfield, New York; assistant professor and professor of Greek at Yale from 1848 until his death. He was the author of a *Greek Grammar* (1860); *Brief History of the English Language* (1864); an *Introduction to Webster's American Dictionary of the English Language*; *Elements*

Hadrianopolis. See ADRIANOPOLE.

Hadrian's Villa, near Tivoli (Tibur), about 17 m. N.E. of Rome, Italy, a country seat of the Emperor Hadrian, now a heap of ruins. There were fine gardens, a palace, temples, a stadium, and theatres. The Roman museums contain many of its treasures.

Haeckel, ERNST HEINRICH (1834), German biologist, famous alike for his detailed zoological researches, and for his great generalizations on biological topics, was born at Potsdam. In 1861 he began to lecture at the University of Jena, was four years later appointed professor of zoology there, and has passed his whole life in this same position. His zoological researches have been confined chiefly to the Invertebrata, the most important works being *Die Radiolarien* (1862 and 1887-8), *Die Kalkschwämme* (1872), *Das System der Medusen* (1879-81), all classics in their own particular line, and his *Challenger* reports—*Deep-sea Medusæ*, *Siphonophora Keratosa*, and *Radiolaria* (1882-8). All these are beautifully illustrated, the author being renowned for his ability as a draughtsman. Of general biological interest is his work on animal morphology (*Generelle Morphologie*, 2 vols. 1866), which contains in germ much which has been subsequently put forward by others. It has been further supplemented by *Systematische Phylogenie* (1894-6). Haeckel was the first naturalist who drew up genealogical trees to show the descent of animals. His 'gastræa theory,' based upon his 'fundamental biogenetic law,' that the ontogeny or development of the individual is a recapitulation of the phylogeny or development of the race, has won wide acceptance among naturalists, and, though it has undergone some modifications, still lies at the base of all modern zoological classifications.

Of Haeckel's more popular works, the *Hist. of Creation* (4th Eng. ed. 1892) was first published in 1838 in German (*Natürliche Schöpfungsgeschichte*; 10th ed. 1902). His *Anthropogenie* (1874; 5th ed. 1903, etc.), translated into English as *The Evolution of Man* (1879; new ed. 1903), has been very widely read. His *Ursprung des Menschen* (1898; Eng. trans. *The Last Link*, 1899) contains his final conclusions on the origin and descent of man, as based upon the latest palæontological discoveries. A voyage to the E. Indies and Java resulted in *Aus Insulinde* (1901). What may be regarded as the summary of his speculative views as to man's position in the universe, the final exposition of his views as to the evolution of organic life from the albuminoid compounds of carbon (the 'carbon theory'), is contained in his *Die Welträtsel* (1899; new ed. 1903); Eng. trans. *The Riddle of the Universe* (1900), and in *Die Lebenswunder* (1904; Eng. trans. 1905). See *Life*, in German, by Bölsche (1900); *Breitenbach* (1904); *Enteir Ketungs Gedanken* (1905); and *Wanderbilder* (1905).

Hæmatemesis, the medical term for the vomiting of blood which proceeds from the stomach. It results commonly from a gastric ulcer, and is generally distinguished by its brown colour ('coffee-ground'), as distinguished from the bright arterial blood which comes from the lungs or throat. Treatment is by complete rest; fluid diet, principally milk and soda-water; and frequently by blood-tonics, at a later stage.

Hæmatinuria. See BLACK-WATER FEVER.

Hæmatite, a common mineral of a blood-red colour when powdered, and consisting of ferric oxide (Fe_2O_3). Red rocks of all sorts generally contain finely granular hæmatite. When well crystallized it is steel gray, with bright metallic lustre, and the smooth surfaces of the larger crystalline plates reflect light so perfectly that they have received the name of 'specular iron ore.' The best locality for fine specimens is Rio Marina in Elba, whence it is known as Elba iron ore. Its magnetic properties are much weaker than those of magnetite, the other common native iron oxide. Very small, thin, gray metallic plates or scales of specular iron ore are common in recent volcanic rocks in all quarters of the globe. From their resemblance to mica in habit, they are known as 'micaceous iron ore,' and are usually too impure to be of much use as a source of iron, though they are now often employed in place of sandpaper on boxes of lucifer matches. Micaceous iron ore is also found in crystalline schists, sometimes forming whole rock masses (itabirite), as in Elba, Brazil, Norway, N. America, and elsewhere, and these are largely worked for iron ore. Hæmatite is found also in a fibrous or granular condition. Earthy, impure hæmatite is known as 'red ochre.' Fibrous, concretionary hæmatite is known as 'kidney iron ore,' as it frequently takes the form of rounded, kidney-shaped, lobulate masses, which, when broken open, consist of radiating dark-brown fibres. Much of the iron ore of the north of England is of this kind, and in Cumberland and Lancashire there are large and valuable masses of reniform hæmatite in the Carboniferous limestone formation. With these, finely-crystallized specular iron ore is also found, as at Cleator Moor, but it is less common. The Bilbao iron ores, which occur in association with limestone, yield from 50 to 70 per cent. of iron. When finely ground, hæmatite serves as a basis for the manufacture of paint. Goldsmiths and jewellers use burnishers of hæmatite fastened in wooden handles.

Pencils of fibrous hæmatite are used by stonecutters for marking and drawing on stone. Powdered hæmatite serves as a polishing material for preparing surfaces of tin, gold, silver, etc.

Hæmatocele, in surgery, the swelling caused by blood effused under the coverings of the testicle. It may follow after a hydrocele, or may be the result of a blow or other injury to the testicle. It is distinguished from a hydrocele, which contains lymph, by not being translucent, and generally by being firmer and heavier. The two may be combined. It may be mistaken for a tumour of the testicle, but may often be diagnosed by the suddenness and other circumstances of its occurrence. Rest, support, and cooling applications must be used in the acute stage, if there is any sign of inflammation. In the chronic condition the blood is drawn off. Sometimes an incision must be made, or a trochar and canula used, before a hæmatocele can be diagnosed. It differs from simple hernia in giving no impulse when the sufferer coughs.

Hæmatoxylin ($\text{C}_{16}\text{H}_{14}\text{O}_5$) is the colouring principle extracted from logwood. It forms yellow crystals that are slightly soluble in cold water. It is chemically of a phenolic character, and on oxidation becomes converted into a red substance, hæmatestin. It is much used in microscopy as a nuclear stain, in conjunction with eosin or other cytoplasmic stain.

Hæmatozoa, a general term sometimes applied to various organisms found in the blood of man or animals. But the term has no zoological significance.

Hæmaturia, in medicine, the condition in which blood is passed with the urine. It may be due to disease of the kidney, bladder, urethra, or prostate, or to some injury following a blow. It may also be caused by parasites in the blood (*Bilharzia hæmatobia*), and by overdoses of certain drugs, such as turpentine, cantharides, etc. Treatment requires the removal of the cause; but rest, sometimes external applications of ice, and the internal administration of such hæmostatics as ergot or adrenalin, may be necessary.

Hæmodoraceæ, an order of monocotyledonous plants, mostly natives of sub-tropical countries. They derive their name from the blood-red liquid obtained from the roots of many species. They bear flowers mostly with bell-shaped perianths, downy on the outside.

Hæmoglobin, the chief component of the red corpuscles of the blood, to which blood owes its colour and power of carrying oxygen. Hæmoglobin readily unites

with the oxygen of the air to form the bright scarlet oxyhæmoglobin, which gives up its oxygen again to oxidize the dissolved food with which it is brought into contact in the tissues. Hæmoglobin and its derivatives are readily recognized by the characteristic bands of their absorption spectra; and the hæmatin, from dried blood, by the formation of the microscopic but distinctive crystals of its hydrochloride (hæmin) on evaporation with salt and glacial acetic acid.

Hæmoglobinuria. See BLACKWATER FEVER.

Hæmophilia, a constitutional and congenital disease in which uncontrollable hæmorrhage often follows a slight wound or other trivial injury, such as an abrasion or a bruise. The subjects of this disease are often spoken of as 'bleeders,' or as having the hæmorrhagic diathesis. Hæmophilia occurs most commonly in males, but is transmitted through the female line, generally by alternate generations. The hæmorrhage sometimes takes place into the tissues, the joints, the alimentary canal, or some of the body cavities. In all hæmophilic patients superficial bruises are readily produced, and contusions are commonly followed by considerable extravasation of blood into the connective tissue. The hæmorrhage may persist for days and weeks. Treatment is in many cases futile, and in nearly all unsatisfactory. Of local styptics perchloride of iron is most useful, and in recent years the application of powdered supra-renal extract has been followed by a fair measure of success. A pigment of a five per cent. solution of gelatin has been strongly advocated. The internal administration of iron and ergot may contribute to arrest the bleeding in the less severe cases. Except when the patient is *in extremis*, the injection of saline solution into the rectum is sometimes followed by a happy result.

Hæmoptysis, the spitting of blood which comes from the lungs, as distinguished from hæmatemesis, in which the blood comes from the stomach. Hæmoptysis arises from the rupture of an artery in the lung-tissue, and the blood is usually bright in colour. The immediate treatment is absolute rest in bed, with careful, regular breathing, and no talking, excitement, or exertion of any kind. An ice-bag may be put to the chest, and food must be of the lightest description. Morphia is often given to keep the patient at ease, and ergot, by the mouth or hypodermically, as a hæmostatic. Adrenalin is another very powerful hæmostatic.

Hæmorrhage, the discharge of blood from the vessels which normally contain it. Three varieties of bleeding are described—arterial, venous, and capillary. In arterial hæmorrhage the blood is bright red in colour, and is ejected in spurts which correspond to the cardiac contractions. Venous blood is dark purple, and it flows without pulsation; while in capillary hæmorrhage there is a general oozing from the damaged vessels. When a large artery is severed, the sudden withdrawal of a great quantity of fluid from the circulation produces rapid collapse, and, it may be, death in a few minutes; but when the loss of blood is more gradual, a greater quantity may be shed without a fatal result, although grave constitutional symptoms may still ensue. Hæmorrhage may occur as a result of disease of the blood or of the vessels, or it may follow an injury.

The natural arrest of hæmorrhage depends upon the coagulum or clot of blood forming a plug, and sealing the damaged vessel, whose orifice is at the same time lessened by the contraction of the elastic and the muscular coats of its wall. The surgeon's aim should be to assist nature in the formation of a firm clot. In many cases pressure for a few minutes suffices to arrest the hæmorrhage. When, however, a large artery is wounded, or when the bleeding point is inaccessible, it may be necessary to compress the artery against a bony surface either with the fingers or with a pad and tourniquet. The end of the bleeding vessel may also be tightly grasped by forceps—'forcipressure.' In acupressure, a needle is passed through the adjacent tissues in such a way as to bridge over the wounded artery, and the pressure may be increased by coiling a thread round the projecting ends of the needle in a figure of eight. In torsion, closure is effected by catching the vessel, either alone or with the surrounding tissues, and twisting it into a knot. But the operation of ligature is of more general application. An aseptic cord is tightly tied round the vessel, either just above the seat of injury, or in some cases at a little distance from the wound. When an artery is the source of hæmorrhage, it usually suffices to ligature the proximal end—i.e. the end next the heart; but when a vein is severed, especially if there be any varicosity, it is advisable to secure both the proximal and distal ends of the vessel. Ice and cold water are excellent styptics, as also is water at a temperature of 120° F. A solution of per-

chloride of iron is usually effective in hæmorrhage from smaller vessels; and although of late years the cautery has fallen somewhat into disuse, it must still rank as a powerful agent in the arrest of bleeding. Drugs which contract the blood-vessels, such as adrenalin, applied locally, or ergot, given by the mouth or by hypodermic injection, are serviceable chiefly in cases of long-continued or frequent small hæmorrhages.

Hæmorrhagic Malarial Fever. See BLACKWATER FEVER.

Hæmorrhoids. See PILES.

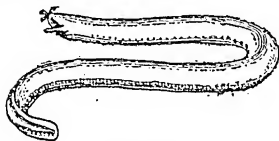
Hæmus. See BALKAN PENINSULA.

Haffs, lagoons of the Baltic, separated from the sea by narrow spits of sand called *nehrungs*. The two largest are the Frisches Haff (50 m. long, 11 m. wide, 10-16 ft. deep), between Danzig and Königsberg, and the Kurisches Haff (60 m. long, nearly 30 m. broad, 6-15 ft. deep), between Königsberg and Memel. The Kurische Nehrung (75 m. long, 1½-2 m. wide) carries sand-dunes, some of them over 200 ft. in height. The third large haff is the Pommersches (Pomeranian), or Stettiner Haff.

Hâfiz (d. 1389), the greatest of Persian lyrical poets, was born at Shiraz early in the 14th century, his real name being Mohammed Shams ed-Din. Scarcely any details of his life are known; all that is certain is that he lived at Shiraz in retirement and literary ease, died and was buried there. At one time he joined an order of dervishes, but the restraints of asceticism proved little to his taste. His fame as a poet spread through all Mohammedan lands. His chief work is a collection (*Divan*) of short odes, or *ghazals*, arranged in couplets and following each other in alphabetical order. They celebrate wine and women, and are of a fervidly sensuous complexion. Oriental commentators, however, regard them as purely mystical, and to be interpreted according to the rules of the Sufi philosophy. There are more or less complete renderings into English by M'Carthy (1893), Bell (1897), Leaf (1898), and Payne (1901), and especially H. W. Clarke (1891). The influence of Hâfiz is strong in Goethe's *West-östlichen Divan*. See Sir Gore Ouseley's *Biographical Notices of Persian Poets* (1846), and Gallienne's *Odes from the Divan of Hafiz* (1905).

Hag, or HAG-FISH (*Myxine glutinosa*), a common British cyclostome or round-mouth fish. The body is naked and eel-like, and there is but a single branchial aperture at each side in place of the seven of the lamprey. The nasal sac is connected with a

duct which opens into the mouth-cavity, and is used for purposes of respiration. The animals are capable of secreting an enormous amount of thick, glutinous slime, whence they derive their scientific names. As in the lamprey, the mouth is suctorial, and contains a muscular 'tongue' bearing comb-like teeth. The hag frequents the mud at the seabottom, and preys on fish, especially gadoids, and is a great nuisance to fishermen from its habit of attacking hooked fish, into whose bodies it often penetrates. It is remarkable in being male in its early stages and female afterwards. The common hag reaches a length of about two feet. In the allied genus *Bdellostoma*, found in the Pacific, there are six or more branchial apertures at each side.



Hag-fish.

Hagar (Heb. 'flight'; cf. *Hajira*), the handmaiden of Sarah and mother of Abraham's eldest son, Ishmael, was of Egyptian origin. Her flight, as recorded in Gen. 16, and her expulsion, ch. 21, are from the Jahvistic and Elohist sources respectively, and present interesting points of comparison. She was regarded as the ancestress of the Hagarenes or Hagarites (1 Chron. 5:10), and Paul uses her as a type of the old covenant (Sinai) and the earthly Jerusalem (Gal. 4:25). See ABRAHAM.

Hagedorn, FRIEDRICH VON (1708-54), German poet, born at Hamburg. After a short residence in London (1729-31), he obtained (1733) the post of secretary to an association of English merchants in his native city, where he resided most of his life. He wrote principally elegant *vers de société*, often on French and English models. His poetical works have been edited by Eschenburg (1890) in 5 vols. See Schuster's *F. von Hagedorn* (1883).

Hageberg, vil. of Prussia, prov. Brandenburg, 22 m. s.w. of Potsdam. Here, in August 1813, the allies, under Hirschfeld, defeated the French.

Hagen, tn., Prussia, prov. Westphalia, lies 33 m. E. of Düsseldorf, and is a growing industrial centre, with iron works, cotton and cloth mills, tanneries, breweries, distilleries, and manufactures of cigars and tobacco, paper, etc. There is a royal school of engineering. Pop. (1905) 77,498.

Hagen, FRIEDRICH HEINRICH VON DER (1780-1856), German scholar, born at Schmiedeberg in Brandenburg. Appointed to the chair of German literature at Berlin in 1810, he removed to the similar chair at Breslau in the following year, and from 1821 held that at Berlin. His great achievement was to revive interest in the old German poetry. His editions of the *Nibelungenlied* (1810), the *Heldenbuch* (1855), the poems of Gottfried von Strassburg (1823), a collection of *Minnesinger* (5 vols. 1838-56), and *Alt nordische Lieder und Sagen* (1814), though now mostly superseded, marked an epoch.

Hagenau, tn., Germany, in Lower Alsace, 28 m. by rail N. of Strassburg. The town is a centre of the hop trade. Pop. (1900) 17,968.

Hagenbach, KARL RUDOLF (1801-74), Swiss theologian, born at Basel, and taught in the high school there from 1823. His most important works are: *Encyklopädie und Methodologie der theologischen Wissenschaften* (1833; 12th ed. 1889; Eng. trans. 1891); *Lehrbuch der Dogmengeschichte* (1840; 6th ed. 1888; Eng. trans. 1880); *Vorlesungen über die Kirchengeschichte von der ältesten Zeit bis 19 Jahrhundert* (1834-61; several Eng. trans.). He also edited a valuable *Leben und Schriften der Väter und Begründer der reformierten Kirche* (10 vols. 1837-62), to which he himself contributed 'Æcolampadius' and 'Myconius.' See his own *Erinnerungen* (1874), and *Life*, in German, by Eppler (1875).

Hagerstown, city, Maryland, U.S.A., co. seat of Washington co., 86 m. w.n.w. of Baltimore, with machine-making, flour-milling, etc. Pop. (1900) 13,591.

Haggai, a prophet of Israel who lived in the early years of the restoration from the captivity. The exiles had returned in 536 B.C., but the work of rebuilding the temple remained in abeyance until 520 B.C., when Haggai arose to urge Joshua and Zerubbabel to proceed with the task without delay. The four short prophecies of Haggai's book are all dated. His style is somewhat prosaic. See commentaries by J. J. Perowne, 'Haggai and Zechariah,' in *Camb. Bible* (1877), Nowack (1901), G. A. Smith in *Expos. Bible* (1896-8).

Haggard, HENRY RIDER (1856), English novelist, was born at Bradenham in Norfolk. In 1875 he was appointed secretary to Sir Henry Pulver, governor of Natal, and in 1877 acted on the staff of Sir Theophilus Shepstone, special commissioner to the Transvaal. In the same year he hoisted the British flag over the S. African Republic, and

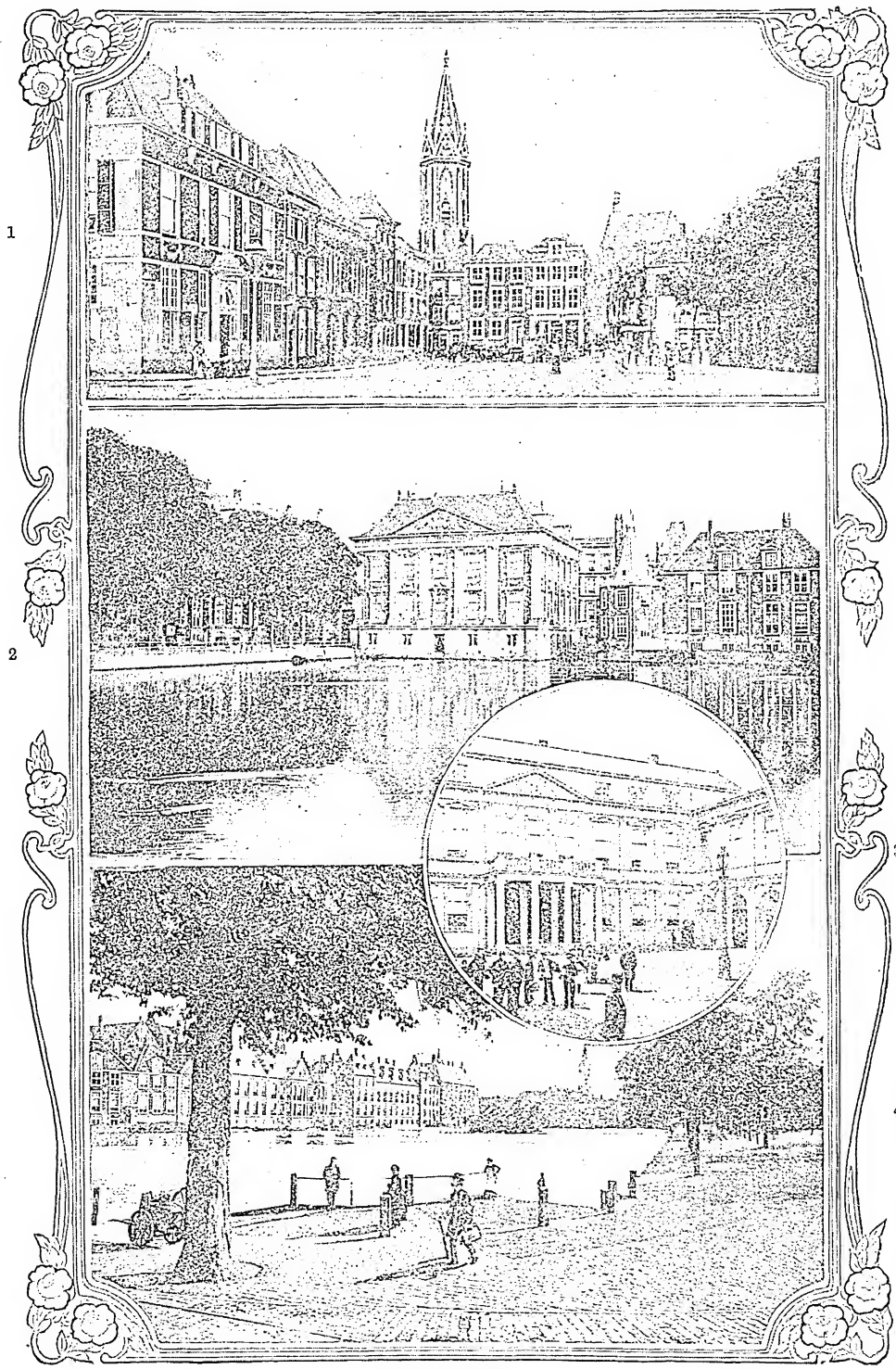
in 1878 became Master of the High Court of the Transvaal. He was specially commissioned by the government to report on the Salvation Army colonies in the United States and at Hadleigh, England, together with a scheme of national land settlement. His report, issued June 1905, broadly shows that such colonies, though socially a success, are financially a failure. As a novelist, Mr. Haggard has made good use of his S. African experiences in many thrilling stories. Among them are *Dawn* (1884) and *King Solomon's Mines* (1885), which first established his fame as a writer of stories of incident; then came *She* (1887), *Jess* (1887), *Allan Quatermain* (1888), *Maiwa's Revenge* (1888), *Mr. Meeson's Will* (1888), *Colonel Quaritch, V.C.* (1888), *Cleopatra* (1889), *Allan's Wife* (1889), *Beatrice* (1890), *Eric Brighteyes* (1891), *Nada the Lily* (1892), *Joan Haste* (1895), *Heart of the World* (1896), *Pearl Maiden* (1903), and *Ayesha* (1905). Mr. Haggard has also written *A Farmer's Year* (1899), *Rural England* (1902), *The Poor and the Land* (1905), and *A Gardener's Year* (1905).

Haggis, an ancient Scottish dish, is a pudding made as follows:—The stomach of a sheep, having been well washed and then soaked in salt water, is turned inside out, scalded in boiling water, and scraped. Pierce the liver, heart, and lungs of the sheep so as to allow the blood to escape. Boil them for an hour and a half, mince them, and also mince and add a couple of onions, half a pound of oatmeal, a pound of suet, a teaspoonful of pepper, and half a teaspoonful of mixed spices. Add also the juice of a lemon and half a pint of good stock. Place in the prepared stomach bag, sew up securely—leaving space for expansion—and place in boiling water. Boil for three hours or a little longer.

Hagi, tn. on W. coast of Honshu, Japan, 145 m. N.E. of Nagasaki. It was prominent in the national movement against feudalism. Pop. 21,000.

Hagiography. The HAGIOGRAPHIA ('sacred writings') in the Jewish Scriptures included the Psalms, Proverbs, Job, Ezra, Nehemiah, Chronicles, the Song of Solomon, Ruth, Ecclesiastes, and Esther. The Jews also treated Daniel and Lamentations as Hagiographa, as these books were also considered to be inspired, and were included in the canon.

Hagiology, the literature dealing with the lives of the saints of the Christian church. The *Martyrologium Romanum*, which was revised in 1586, contains about 2,700 saints. Of this num-



Views in the Hague.

1. Place du Grand Marché. 2. Le Musée (Maurits Huis). 3. Royal Palace. 4. The Vijver.

ber only a certain proportion find their place in the calendar of the ecclesiastical year. See Baring-Gould's *Lives of the Saints* (17 vols. new ed. 1897); *Acta Sanctorum* of the Bollandists (1881); *Lives of the English Saints*, by Cardinal Newman (1900).

Hagonoy, tn. in prov. and 8 m. N.W. of Bulacan, Luzon, Philippines; produces fabrics. Pop. (1898) 20,120.

Hague, THE, in Dutch *'sGravenhage* or *Den Haag*, official cap. of the Netherlands, prov. S. Holland, stands 2 m. from the North Sea. The centre of the city is the artificial lake known as the Vijver. Around it are grouped the municipal museum, containing a good collection of Dutch pictures; the chief ministries, the royal archives, the parliament houses, the law courts, etc.; the picture gallery, the most precious possession of the city, containing works by Rembrandt, Potter, Jan Steen, Douw, Ostade, Van de Velde, Holbein, Ruysdael, Vermeer, Murillo, Velasquez, and others; and the prison from which the brothers De Witt were dragged and torn to pieces by the mob in 1672. North of the Vijver are the royal palace; the royal library, with over half a million books; the Meermanno-Weetjensianum (museum); and in the centre of the large square 'Plein 1813' the national monument commemorating the recovery of Dutch independence in the year named. West of the same central sheet of water stand the 'Great Church,' a Gothic structure of the 14th century, and the picturesque townhall. The New Church (1649), which stands some distance S. of the Vijver, contains the tombs of the two De Witts and of Spinoza. On the E. side of the city stands a summer palace (*'t huis ten Bosch*) of the royal family, built in 1645. Here the International Peace Conference met in 1899. Constantine Huygens, the poet, and Christian Huygens, the mathematician, were both natives of the city. The industries comprise factories for furniture, gold and silver decorations, a cannon foundry, iron, copper, and lead works, and printing offices. It is at the Hague that Mr. A. Carnegie has undertaken to build a Palace of Peace. Since the end of the 16th century it has been the real capital of the Netherlands. Here were signed a truce between Spain and the Netherlands (1609); a treaty of alliance between the Netherlands and Denmark (1666); the Triple Alliance between England, Sweden, and the Netherlands (1668); an agreement between the Emperor, England, and the Netherlands (1710); the Triple Alliance between France, England, and the

Netherlands (1717); and in the same year the peace between Spain, Austria, and Savoy. Pop. (1875) 100,254; (1899) 206,022.

Hague, CAP DE LA, cape, France, at the N.W. extremity of the Cotentin peninsula, between Cherbourg and the island of Alderney. It must not be confounded with the roadstead of La Hogue, which lies on the east side of the same peninsula, and E. by S. of Cherbourg, in which, on 19th May 1692, the French fleet intended for the support of James II. of England was defeated by the English and Dutch fleets with the loss of twelve battleships.

Hague Conference. The outcome of the deliberations of the peace conference, which was assembled at the suggestion of Nicholas II., Czar of Russia, with the object of effecting a general reduction of armaments, was signed at the Hague on July 29, 1899, and consists of three different parts, which are really separate conventions. The first deals with the settlement of international disputes by arbitration, and contains an elaborate series of rules for the appointment of arbitrators and umpires, and for their guidance. The second convention deals with the laws and customs of war, and comprises a considerable number of the clauses or articles accepted at the Brussels Conference of 1874, which was also assembled at the instigation of Czar Alexander II. of Russia. The third convention deals with the application to naval warfare of the principles of the Geneva Convention. (See WAR.) In addition to these three conventions, declarations were made against throwing projectiles from balloons, the use of missiles intended to diffuse asphyxiating gases, and of expanding bullets. To the last two of these clauses Britain refused to assent, and a proposal for the reduction of armaments was not carried. The Russian government submitted (Oct. 1905) to the powers' proposals for a second peace conference at the Hague in 1907. Most of the powers assented, but stipulated that the scope of the questions to be considered by the conference should be submitted beforehand.

Hahnemann, SAMUEL CHRISTIAN FRIEDRICH (1755-1843), founder of the homeopathic method of treatment, was born at Meissen in Saxony. After holding several appointments, he settled at Leipzig. In 1790, he came to the belief that the true way of treating diseases is to administer that particular drug which causes symptoms identical with or similar to those of the disorder which it is intended to cure. To this principle of

similia similibus curantur he gave the name of homeopathy. He had eventually to flee from Leipzig, but found protection at the hands of the reigning duke of Anhalt-Köthen. Among his works were *Die chronischen Krankheiten*, *Heilkunde der Erfahrung*, *Organon der rationellen Heilkunde*, and *Materia Medica Pura*. See *Hahnemann*, the Founder of Scientific Therapeutics, by R. E. Dudgeon (1882).

Hahn-Hahn, IDA, COUNTESS (1805-80), German novelist, born at Tressow in Mecklenburg-Schwerin. In 1830 she joined the Roman Catholic Church, entering a nunnery at Angers. Her novels deal mainly with aristocratic life, and are conventional and sentimental in tone. The best known are *Gräfin Faustine* (1841; Eng. trans. 1845); *Ulrich* (1841); *Clelia Conti* (1846); *Eudoxia* (1866; Eng. trans. 1868); *Dorothea Waldegrave* (1874; Eng. trans. 1875). See *Life*, in German, by A. Jacoby (1894).

Haicheng, tn., prov. of Liaotung, Manchuria, China, 32 m. S.E. of Newchwang, was the scene of the victory of the Japanese over the Chinese in December 1894, and of a Japanese victory over the Russians in 1904.

Haidarabad, or HYDERABAD. (1.) The dominion of the nizâm, situated in the Deccan, India, and bounded W. by the Bombay Presidency, E. by the Madras Presidency, and N.E. by the Central Provinces. Area, 82,700 sq. m. The principal rivers are the Godavari and the Krishna (Krishna), and large areas have been brought under cultivation by irrigation. Hides are exported, and the industries produce embroidery and metal ware. When the country came (1748) under the contending influences of France and Britain, the nizâm sided with the British, while at a later date Tipu Sahib, the son of Haidar Ali, favoured the French. Extension of Haidarabad dominion followed the fall of Seringapatam and the death of Tipu Sultan (1799). Sixty years afterwards, Berar—also known as the Haidarabad Assigned Districts—was transferred (1861) to Britain in exchange for certain other districts, and in cancellation of a debt of two millions sterling. The nizâm is the premier native chief of India, and the state consists of over eleven millions of Hindus subject to a Mohammedan ruler. Pop. (1901) 11,141,142 (5,673,629 males, 5,467,513 females). (2.) Capital of the above state. Founded in 1589, it is one of the most striking of Oriental cities. Its chief features are the palace of the nizâm, the college (Châr Minâr), and the British

residency. Its market for Decan-bred ponies attracts dealers from all parts of Asia. Pop. (1901) 448,466. (3.) Chief tn. in dist. of same name, Sindh, Bombay Presidency, India. The district—area, 9,030 sq. m.; pop. (1901) 989,030—is an extensive alluvial plain. The town, lying near the delta of the Indus, and defended by a formidable fortress, is of strategic value, and has a large arsenal. Haidarabad was the former capital of the province. It is noted for its fine gold and silver embroideries and its lacquer ware. Pop. (1901) 69,378.

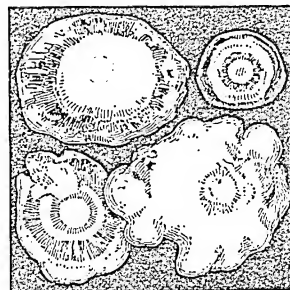
Haidar Ali (1728-82), son of a petty Mohammedan chieftain, won his way to the command of the army of Mysore. He then dethroned the Hindu rajah and proclaimed himself sultan of the province. Having made an alliance with the French, he swooped down from the highlands of My-

kan peninsula; and was applied subsequently to the Hungarian infantry; also, in the 18th century, to the retainers of Hungarian magnates, and to the minor officers of justice.

Haiduong, or **HAIZUONG**, cap. of prov. Haiduong, Tong-king, French Indo-China, 32 m. s.e. of Hanoi, and its once strong citadel; is now half in ruins. Pop. of tn. 8,000; of the dist. (1894) 1,100,248.

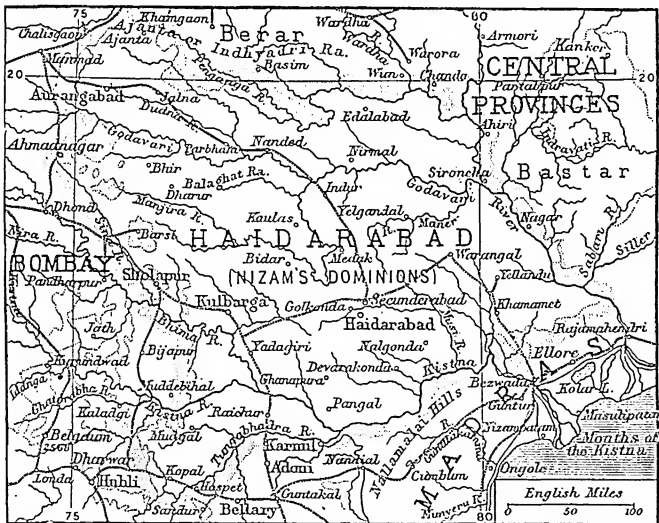
Haifa, or **KHAIFA**, scapt., Syria, on the Bay of Acre, 9 m. s.w. of Acre, and at the foot of Mt. Carmel. From this town a railway to the Hauran and Damascus was begun in 1894, in 1906 had passed the Jordan, and was expected to reach Damascus about the end of that year. About a mile to the w. is the settlement of the German-American Templars, founded in 1869. Pop. (1900) about 12,000. See Laurence Oliphant's *Haifa* (1887).

ing around the rotating hail in its descent. The formation of hail, according to the careful deductions of Rollo Russell, takes



Hailstones.

place in clouds which are commonly at a great height, between 15,000 and 40,000 feet. The prominent conditions associated with the production of these clouds are the expansion and congelation of warm, moist air in a state of cyclonic whirl, combined with the sudden commingling of masses of air differing greatly in temperature and vapour tension. The snowflake or spicule which forms the nucleus of a hailstone originates in the uppermost cloud, and is electrified as a result of condensation. As it falls, particles of ice, or globules of water whose temperature is under the freezing-point, attach themselves to the nucleus, grouping into concentric layers or in a stellate formation. The great variety in the shape of the hailstones is due to the protean form assumed by the primary kernel. The more common top-shaped variety is due to accretions forming more rapidly on the lower side than on the upper, the hardest ice being at the spheroidal base, where the impact is greatest. Although associated with thunderstorms, there is no reason for regarding electricity as the primary agent in the production of hail; but it is when electrical storms are prevalent that strong ascending currents, loaded with hot and moist air, are projected into the cold upper strata of the atmosphere, and electrical clouds are formed. Large hail is usually preceded by an unusual degree of heat, and is chiefly met with in hot, dry climates, and in the hottest part of the day. Hail does not usually accumulate to any depth. In a storm, however, that passed over the Orkney Islands on July 24, 1818, hail fell to the depth of nine inches, some of the stones being as large as a goose egg (Neill, *Trans. Roy. Soc. Edin.*, vol. ix. p. 187). In the city of Mexico hail fell to the depth



Haidarabad.

sore with over 20,000 men, and overwhelmed, in the plains of Madras, two small detachments of British troops, and threatened the extinction of the East India Company. Subsequently Sir Eyre Coote won two signal victories over Haidar Ali, who died on Dec. 7, 1782, bequeathing to his son, Tipu Sahib, the conduct of the campaign.

Haiduks, or **HAYDUKS** (Hung. 'drovers'), originally outlaws who, refusing to submit to Turkish rule, were regarded by the populace as patriots, and found an asylum in the mountains of E. Hungary. The same name was also given to similar bands of semi-brigands among the Bulgarians and Servians in the Bal-

Haifong. See **HAIPHONG**.

Hai-K'ou. See **HOI-HOW**.

Hail consists of compacted ice and snow, usually arranged in concentric layers round a central nucleus of clear ice. A crystalline structure is sometimes seen in hailstones, giving them a rough exterior; but this external sharpness is usually lost either in their fall through the warm atmosphere, or else on the ground before they are lifted. Very beautiful forms are seen at times, the hailstones taking the shape of a cone, with a broad extremity on the flat side of a fluted hemisphere, and with grooves running spirally around the cone. This form is due to melting produced by the effect of aerial currents play-

of sixteen inches on Aug. 17, 1830. It is most frequently observed on the polar side of the 35th parallel of latitude in both hemispheres. True hail is of uncommon occurrence in the British Isles, most of the cases noted being falls of 'grape' (*grésil*), or soft hail, which occur chiefly in winter and spring. It consists of rounded pellets, made up of granular accretions, which are not very hard. Hail insurance offices are met with everywhere on the Continent. See Rollo Russell's *Hail* (1893).

Hailes, LORD. See DALRYMPLE, SIR DAVID.

Haileybury College was founded in 1806 by the East India Company as a training college for cadets, at first in Hert-

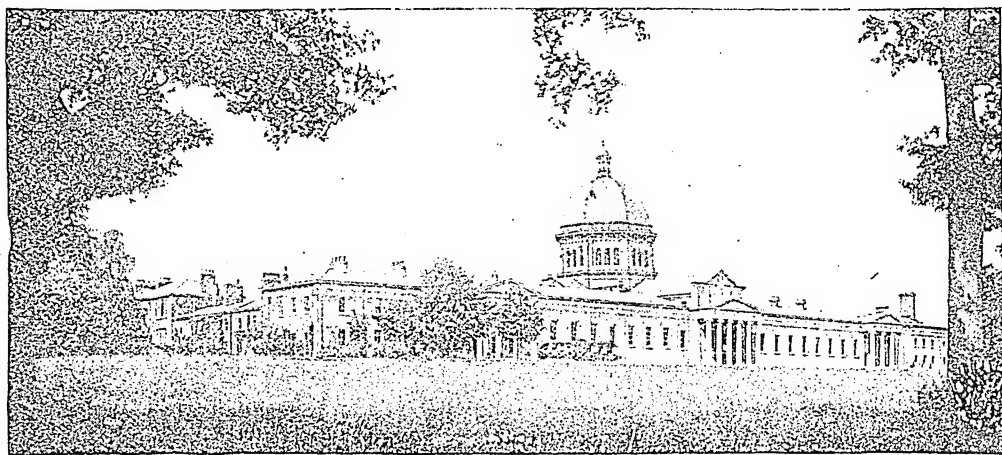
Hainau, or HAYNAU, tn., Prussian prov. of Silesia, 11 m. by rail N.W. of Liegnitz, with cloth and other factories. Pop. (1900) 10,142.

Hainault. (1.) HENNEGAU, or HENNEGOUWEN, prov. of Belgium, lies alongside the French dep. of Nord. It is generally level, but broken by spurs of the Ardennes. It produces large quantities of coal (Mons and Charleroi), iron and steel, lace, pottery, and linen. From the 9th century to the 17th Hainault formed an independent countship, but from 1678 it was divided between France and the dynastic rulers of Spain and Austria. It is the latter section which forms the present Belgian province. Chief tn. Mons. Area, 1,437 sq. m. Pop. (1900) 1,142,954,

in 1874, it has been a municipality since 1888. A railway runs to Hanoy (60 m.). The chief industries in the province, which is not more than from 300 to 350 sq. m. in area, are rice-growing and fishing. There are also a cotton mill, salt pans, and brick-kilns. Pop. (1894) of prov. 68,520; of tn. 17,000.

Hair, the characteristic covering of mammals, is never completely absent in any mammal. Its primary function is to maintain the body temperature by diminishing the loss of heat; but in very many mammals certain of the hairs function also as sense-organs, constituting the *vibrissae*, or whiskers.

Histologically, hairs are outgrowths of the epidermis, and de-



Haileybury College.

ford Castle; the present school buildings, situated two miles from Hertford, were opened in 1809. In 1862, after an interval of four years, a new 'public school' was established in the old premises. See Higgin's *Old and New Haileybury* (1887).

Haimura (*Erythrurus macrondon*), a large fresh-water fish belonging to Günther's family of Characidae, which is very abundant in the rivers of Guiana, S. America, and is much used by the natives as food.

Hainan, large island off the coast of Kwang-tung prov., China, about 150 m. long and 100 m. broad, with an area of 16,000 sq. m., and a population estimated at 1,500,000. The coasts are flat, while the mountain chains of the interior are densely wooded (*e.g.* eagle-wood). The chief products are sugar-cane, cotton, tobacco, coconuts, and their products. Kiung-chou-fu, the capital (pop. about 50,000), is about 3½ m. from its port, Hoihow.

principally Walloons. (2.) HAINAULT FOREST, a former forest, Essex, England, to the S.E. of Epping Forest. Round the 'Fairlop oak' (blown down 1820) an annual fair was long held. The area was deforested about 1850.

Hainburg, tn., Lower Austria, on riv. Danube, 27 m. S.E. of Vienna. Its old castle, identified with that of Heimbure, was taken by Henry III. from the Hungarians; in 1482 it was captured by Matthias Corvinus, king of Hungary; and in 1683 it was taken by the Turks. It makes tobacco and needles. Pop. (1900) 6,225.

Hainichen, tn., kingdom of Saxony, 10 m. W.N.W. of Freiberg, manufactures flannel (chief centre in Germany), plush, and leather. It is the birthplace (1715) of Gellert. Pop. (1900) 7,932.

Haiphong, or HAIFONG, cap. of prov. of Haiphong, Tong-king, French Indo-China, and principal port of Annam, on a branch of the Red River delta. Founded

velop in little pits known as the hair follicles. These follicles lie in the corium or true skin, or, in the case of some hairs, even penetrate into the subcutaneous tissue. Epidermis forms the inner layer of the follicle, and as it surrounds the base or root of

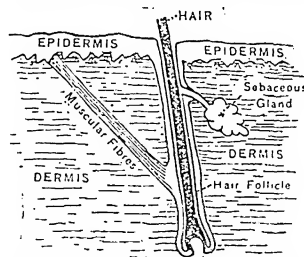


Diagram of the Root of a Hair.

the hair very closely, it is often dragged out with the hair if this be pulled out, and is consequently known as the root-



Ancient and Mediæval Modes of Dressing the Hair.

1-5. Egyptian. 6-9. Assyrian. 10. Persian. 11-16. Greek. 17, 18. Roman. 19. Early British. 20. Saxon. 21. English 13th century. 22. Elizabethan. 23, 24. English (17th century).

sheath. The corium rises up at the base of the follicle as a vascular papilla; this is the important structure as regards the growth of the hair, and is also important in fixing the hair in position, for the hollow base of the root fits over this projecting papilla like a cap. The hair itself may be divided into the body, or shaft, and the root. The shaft has externally a cuticle of overlapping scales; beneath this is a pigmented fibrous layer; while the centre in some cases is occupied by a dark-coloured medulla, composed of angular cells, between which air-bubbles may occur. The root is similar in structure, but is enlarged, and consists chiefly of young growing cells. It is the papilla which supplies the material necessary for the growth of the hair.

Each hair follicle has attached to it a little bundle of muscular fibres, by means of which the hair may be erected. These muscles are of the non-striated type, and cannot be made to contract voluntarily; but they do so under the influence of certain emotions—*e.g.*, fear. The condition known as 'goose-skin' is due to the erection of the hairs.

The colouring of the hairs is due primarily to the nature and amount of the pigment present in the fibrous layer of the hair. When minute air bubbles appear in this layer the hair is white. The colour of the hair is affected also by the colour of the medulla, when present; for it may also contain air bubbles, whose presence in this instance imparts a dark colour. The nature of the imbricating scales has also an important influence on the colour.

The long hair of the head and the beard of man are to be regarded as sexual ornaments, comparable to the mane of the lion and the fringes of hair present in some monkeys. The average length of the hairs of the head in women is from twenty-two to twenty-eight inches. The detailed characters of human hair often correspond to racial differences, the crisp, woolly hair of negroes being a familiar example of a racial type. The curl of the negro's hair has been shown to be due to the curvature of the hair follicles.

Hairdressing. The Babylonians, Chaldeans, and Egyptians cultivated rows upon rows of regular curls, while the men wore square beards. Among the Greeks one fashion consisted of a ribbon bound round the head, the hair being gathered up in a loose knot at the back of the neck; in another more elaborate fashion the hair was cut, curled all over, confined by bands on the forehead, and gathered up

at the back of the head by a ribbon, from which it fell in loose curls. Greek and Roman men had short hair and square beards or shaven faces. Roman women plaited and curled their hair in regular ringlets all round the forehead. The diadem was much favoured by Greeks and Romans. Gauls and Britons wore long, flowing locks and untrimmed beards; but the Romans introduced the custom of wearing short hair. The Saxons, who were proud of their long, fair hair, wore it loose, divided in the middle; their beards were trimmed into two points. The Normans cut their hair short, shaving their faces and the back of their heads, but soon began to copy the English custom of having long hair. The women wore long plaits, twisted with ribbon or confined in silken cases. Henry I. and Henry II. favoured the Norman mode; but long hair again became fashionable after their deaths. In the days of Henry III. the hair was cut halfway to the shoulders, waved and curled; beards were short, and trimmed to two points; the women confined their tresses in cauls of gold network. Subsequently men's hair was cropped all round in a straight line, and the women wore wimples, showing only a solitary curl on the forehead. In the times of Edward IV. and Henry VII. hair was again worn long; while Henry VIII. and his subjects favoured closely-cropped heads. In Elizabethan days a lady's coiffure was piled up elaborately and adorned with jewels, and false hair abounded; men wore short hair, their fancy lavishing itself upon the beard. This took many forms: the swallow-tailed, *pique-d'avant* (as in the modern fashion), spade or round, sharp (stiletto), or the T beard (modern 'imperial'), with moustaches spreading laterally. Jacobean women brushed their hair back tightly under a coif; side curls were added to this later. Cavaliers wore pointed beards, long, curling hair, and a straggling love lock over the left shoulder. 'Roundhead' describes the prevailing mode during the commonwealth. Charles II. brought French fashions; men wore enormous perukes falling over their shoulders; women spread their hair out at the sides over cushions, with ringlets falling therefrom. Wigs—which grew gradually smaller—and shaven faces were modish during the reigns of William, Anne, George I., and George II., and powder became general. Wigs were discarded about 1800, and men wore their hair long, powdered, and tied in a queue. Queen Mary and Queen

Anne turned their hair back simply from the forehead, with side ringlets. The 'commode,' a high cap of lace and ribbon, next appeared, and became smaller as coiffures became higher. In 1760 a lady's hair was turned up over tow to three feet in height, plastered with pomade and powder, adorned with false curls, ribbons, jewels, flowers, and ostrich feathers. A head when thus dressed 'kept for three weeks.' After the fall of the French monarchy comparative simplicity reigned: powder was eschewed, and a scarf was the only decoration; this later became the turban, under which the hair was brushed up tightly at the back, with or without side ringlets. In 1830 simple braids were fashionable. At this period men shaved their chins and wore short side whiskers; these gradually became longer, the climax being reached with the Dundreary whisker, which caused a reaction in favour of total shaving or the wearing of beards. The enormous chignon of 1870 gave way to equally enormous plaits; since then comparatively simple fashions have prevailed.

Hair Powder usually consists of pulverized starch. The custom of wearing it became general in the 18th century. Powder is at present only worn by footmen.

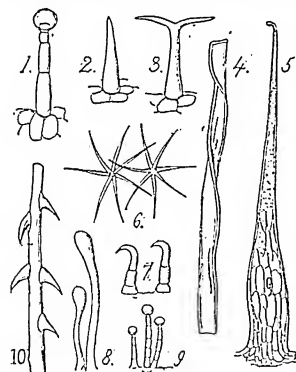
Hair Dye.—The general method of darkening the hair is to wash it with some metallic salt, such as salts of silver, mercury, lead, or bismuth. The best method of obtaining a good black is to soak the hair in a solution of sulphide of potassium, and when this is partially dry to saturate it with a solution of nitrate of silver. The stronger the solutions the darker the hair will be; the dye is fairly permanent. Pyrogallol acid gives a brown tint; peroxide of hydrogen in water a bright golden hue.

Trade.—The British trade in hair is considerable. Supplies of the dark varieties come from France, Italy, and Belgium, where a regular traffic is carried on by the peasant girls, the hair being collected at stated seasons by agents. A coarser variety comes from India and China. Germany and Scandinavia supply the fair tints. Hair obtained from living persons is superior to that obtained after death. A bright golden tint is the most valuable. See De Villermont's *Hist. de la Coiffure Féminine* (1892); G. d'Ezès's *Hist. de la Coiffure des Femmes en France* (1886); Fairholt's *Costume in England* (3rd ed. 1885); G. Hill's *Hist. of English Dress* (1893); Challamel's *Hist. of Fashion in France* (1882); Planché's *Cyclopædia of Costume* (1876-9).

Hair Grass (*Aira*) is a genus of perennial grasses of agricultural value. They are characterized by a lax panicle, the spikelets being laterally compressed, with two perfect florets. The commonest British species is *A. caespitosa*, the tufted hair grass.

Hair Industries. The hair of animals is often used in combination with wool and other fibres. Horsehair, however, has a distinct place, and is largely used in upholstery. That from the tail is known as hard, while that from the mane is called soft. Hair from a dead animal is of very inferior quality. After cleansing, the hair is combed and arranged into different lengths and sizes, and is often dyed. It is then used in the production of different qualities of toilet and other brushes, fishing-lines, and fancy articles. Its most important use is in the making of haircloth. For this a particular kind of loom is used, in which there is a fine pair of nippers, or picker, which picks up each hair and lays it between the warp. Short hair is curled for the stuffing of chairs and sofas. The hair is spun into ropes, but the curl so given has to be fixed by immersion in cold water for several hours. It is then sterilized in an oven, and the rope is untwisted.

Hair in Plants. Hairs are appendages to the epidermis; they are composed of one or more cells, and are of very varied functions. Perhaps the most common function is to check the transpiration of water vapour, as



Hair in Plants.

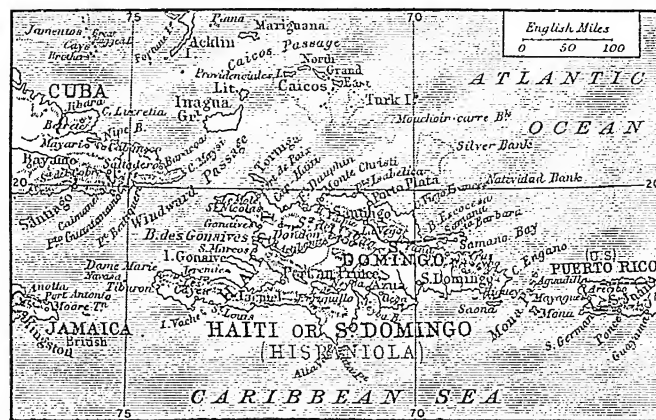
1. Priusose (many-celled). 2. Cabbage (one-celled). 3. Whitlow grass. 4. Cotton. 5. Stinging nettle (glandular). 6. Stellate (Aithra). 7. Uncinate. 8. Clavate. 9. Capitate. 10. Prickles (rose).

is well illustrated by the edelweiss, the felted whitlow grass, and the bitter milfoil. In certain plants we have glandular hairs, as in the stinging nettle and in the sweet-brier; while

in others the hairs are hardened into prickles. The cotton of commerce is a preparation of the hairs covering the seeds of the cotton plant. When several hairs seem to radiate from a common point, the hairs are said to be 'stellate,' as in the mallow; those which gradually expand towards their summit are said to be 'clavate'; those which are hooked are called barked, or 'uncinate'; and hairs enlarged at the apex are called 'capitate.'

inum, silver, copper, iron ore, tin, manganese, antimony, sulphur, rock-salt, bitumen, asphaltum, and phosphates exist, some in large quantities, but are scarcely worked. Communication is maintained almost entirely by bad roads and by coasting vessels.

In the early part of the 17th century French and English buccaneers took possession of the western part of the island, and the French established a colony in 1640. Napoleon's attempt in



Haiti, or Santo Domingo.

Hair-tail (*Trichiurus*), a tropical fish with a handlelike body tapering to a fine point. There is no caudal fin, and the dorsal fin extends the whole length of the back; the ventral fins are reduced or absent. The common W. Indian hair-tail (*T. lepturus*) sometimes occurs on the coast of England, where, no doubt, it is brought by the Gulf Stream.

Haiti, SANTO DOMINGO, or HISPANIOLA, an independent island, W. Indies. Length, 400 m.; breadth, 24 to 165 m.; area, 28,249 sq. m. It consists mainly of densely-wooded mountains, with fertile valleys. The highest point, Loma Tina, exceeds 10,000 ft. The coast is lofty, and is indented by many good harbours. Disastrous earthquakes are frequent, but there are no volcanoes. Haiti now designates (a) the whole island, and (b) the republic of Haiti (*République d'Haiti*).

The republic of Haiti comprises the western third of the island, and has an area of 10,204 sq. m. The most important product is coffee. Then come logwood, cocoa, and cotton. The imports in 1901 amounted to £1,100,000, and the exports (coffee, cocoa, logwood, etc.) to £2,552,000: the values for later years have not been published. The debt of the republic (Dec. 31, 1905) amounted to about £5,624,676. Gold, plat-

1802 to re-enslave the blacks, who had been freed in 1794, resulted in a series of massacres, ending in the erection of a negro republic in 1804. (See TOUSSAINT L'OUVERTURE and DESSALINES.) The executive power is in the hands of a president, who is generally chosen by the National Assembly, and holds office for seven years. Roman Catholicism is the established religion. Pop. (1905) 1,425,000, almost entirely of African descent. Cap. Port au Prince. See SANTO DOMINGO; also Pritchard's *Where Black Rules White* (1900), St. John's *Haiti* (2nd ed. 1889), Tippenhauer's *Die Insel Haiti* (1893), and Vibert's *La République d'Haiti* (1895).

Hai-yun-tau, BATTLE OF. In the war between China and Japan (1894-5), the Chinese admiral Ting was surprised off the Yalu, Korea, by the Japanese fleet under Vice-admiral Ito. The latter won a complete victory.

Hajdu, or HAJDUKEN, co. in Hungary, E. of the Tisza (Theiss), in the great Hungarian plain. The people carry on agriculture and rear live stock. Chief tn. Debreczen. Area, 1,294 sq. m. Pop. (1900) 220,870.

Hajdu-Boszormeny. See BOSZORMENY.

Hajdunanas, tn., Hungary, co. Hajdu, 23 m. by rail N.W. of Debreczen. Pop. (1900) 15,877.

Hajduszoboszlo, tn., Hungary, co. Hajdu, 14 m. s.w. of Debreczen. Pop. (1900) 15,444.

Hajipur, tn., Muzaffarpur dist., Bengal, India, on Little Gandak, close to its confluence with the Ganges, 8 m. N. of Patna. It has considerable river trade.

Haji. See HADJ.

Hake (*Merluccius vulgaris*), a fish belonging to the cod family. It possesses two dorsal and one ventral fin; has no barbel; the mouth is large, with two rows of pointed teeth in the jaws; it is dark gray on the back, and lighter on the sides and below. It does not usually exceed 3½ ft. in length. The hake is widely distributed from Norway to Madeira, on the American coast as far south as Cape Hatteras, and in the Mediterranean. It is wandering and predaceous, living largely upon herrings, mackerel, sprats, and other fish. It spawns in March, April, May, and June, and the eggs float in the water (pelagic). The hake landed on the English and Irish coasts annually reaches a value of over a quarter of a million sterling. Hake-fishing in the Mediterranean is also important.

Hake, THOMAS GORDON (1809-95), English poet, sometimes called 'the parable poet,' was born at Leeds. He was physician to the county hospital of Suffolk from 1839 to 1853, and to the West London Hospital for five years more. Thereafter he practised in London. Dr. Hake took his place with *Parables and Tales* (1872), strengthening it with *New Symbols* (1876). His other works are *Legends of the Morrow* (1879); *Maiden Ecstasy* (1883); *The Serpent Play* (1883); and *The New Day* (1890), a series of sonnets. Original in standpoint, vigorous and suggestive in elaboration, and skilled in choice and adaptation of expressive imagery, Dr. Hake appeals to the studious reader of poetry. Hake's interesting *Memoirs of Eighty Years* appeared in 1892, and his *Select Poems* (ed. Meynell) in 1894.

Hakim ibn Allah. See AL-HAKIM IBN OTTO.

Hakkas, a hard-working and frugal people in the Chinese provinces of Kwang-si, Kwangtung, and Fu-kien; also as immigrants in Formosa, Hong-kong, Hainan, and even in the Straits Settlements. They have for over two thousand years been persecuted by the native population. Tradition assigns their origin to Shantung and other parts of N. China about the middle of the 3rd century B.C. They are said to number about 4,000,000.

Hakluyt, RICHARD (1552-1616), English geographer. Appointed to lecture on naval matters at Oxford, he was the first to introduce maps, globes, spheres, etc.,

into the common schools. In 1582 he published his *Divers Voyages touching the Discovery of America*. He was one of the chief organizers of the South Virginian Company. Hakluyt also published *Principall Navigations, Voyages, and Discoveries of the English Nation* (1589; revised ed. 1598-1600; new reprints 1889-90 and 1903-5), and *A Notable History, containing four Voyages made by certain French Captains into Florida* (1587). See *Select Narratives from Hakluyt's Principall Navigations* (ed. Payne, 1893-1900). A fine edition of Hakluyt was issued by Messrs. Maclehose of Glasgow (1903-5).

Hakluyt Society, established in 1846, with the object of printing rare or unpublished voyages and travels. More than a hundred volumes have been issued by the society, the majority of them illustrating the history of the great age of discovery.

Hakodate, or HAKODADI, seaport and treaty port, Japan, on Tsugaru Strait, in the s. of Yezo I.; has a splendid harbour. The exports in 1905 were edible seaweed, sulphur, dried fish, rice, salt, bags, etc., to the value of £231,653; imports to the value of £91,085. Pop. (1901) 89,454.

Hakon. See HAAKON.

Hakone, mountainous dist., Izu, Japan. The village of Hakone, on Lake Hakone (3½ m. long and 114 m. in circuit), is famous as a health resort.

Hal, tn., Belgium, prov. Brabant, 10 m. s.w. of Brussels; is a place of pilgrimage. There are manufactures of sugar, paper, and porcelain. Pop. (1900) 12,615.

Halas, or KISKUNHALAS, tn., Hungary, Pest co., 84 m. by rail s.s.e. of Budapest; produces wine. Pop. (1900) 19,856.

Halberstadt, tn., Prussia, prov. Saxony, stands at the N. foot of the Harz Mts., 36 m. by rail s.w. of Magdeburg. Many of the houses date from the 15th and 16th centuries. Its most important buildings are the cathedral (13th to 15th century), the churches of Our Lady (1135-46) and St. Martin (1350), the 14th-century town hall, and the former episcopal residence. The industries include railway repairing works. The poet Gleim lived here for some years. Pop. (1900) 42,810.

Halbert, or HALBERD, a weapon, forming a spear and battle-axe combined, which was in constant use during the 15th and 16th centuries. Halberds originated in Scandinavia and Germany, and were introduced into France by the Swiss in 1420. The blades vary in shape from a very narrow, curved, pronglike sort to the heavy, broad, double-edged examples characteristic of the Swiss type. The halbert is

still carried on ceremonial occasions by the English yeomen of the guard.

Halcyon. See ALCYON.

Haldane, JAMES ALEXANDER (1768-1851), Scottish preacher, was born at Dundee. Settling at Edinburgh (1794), he, along with his brother Robert and others, established the Society for Propagating the Gospel at Home (1797), and, having seceded from the Church of Scotland, founded and became pastor in Edinburgh of the first Congregational church in Scotland (1799). His numerous controversial writings are less worthy of remembrance than his itinerating evangelistic tours throughout Scotland, and his gratuitous pastorate of the great 'Tabernacle' built for him by his brother in Leith Walk, Edinburgh. See Alexander Haldane's *Lives of Robert and James A. Haldane* (1852).

Haldane, RIGHT HON. RICHARD BURDON (1856), British Liberal statesman and philosopher, was born in Edinburgh. He was called to the bar (Lincoln's Inn) in 1879, and took silk in 1890. His political career began in 1885, when he was returned to the House of Commons for Haddingtonshire, and he still retains the seat. Mr. Haldane has taken special interest in the political position of women. A Liberal Imperialist, he is a very lucid, restrained, and powerful speaker. His speeches in 1903 against Mr. Chamberlain's revolutionary fiscal policy had a marked effect upon general opinion. In Sir H. Campbell-Bannerman's administration he was appointed (December 1905) minister of war, and in July 1906, under his new army scheme, the army was reduced by ten battalions. Mr. Haldane is joint author and editor with Professor Seth Pringle-Pattison of *Essays in Philosophical Criticism* (1883); joint translator with Mr. Kemp of Schopenhauer's *World as Will and Idea* (1883); and the author of a *Life of Adam Smith* (1887) for the Great Writers Series. He has also written a work on *Education and Empire* (1902), and *The Pathway to Reality* (1903). He was appointed Gifford lecturer at the University of St. Andrews in 1902 and 1903, and in 1905 was elected Lord Rector of Edinburgh University.

Haldane, ROBERT (1764-1842), Scottish religious propagandist, brother of James A. Haldane, born in London. He spent large sums in building 'tabernacles' in big cities and founding seminaries for students. In Geneva and in Montauban he greatly influenced university students by personal intercourse (1817), and in the latter place printed editions of the Bible in French,

and a translation into French of his *Evidences* (1817). His best-known works are *The Authenticity and Inspiration of the Holy Scriptures* (1828) and *Exposition of the Epistle to the Romans* (1835-9). See Alexander Haldane's *Lives of Robert and James A. Haldane* (1852).

Hale, EDWARD EVERETT (1822), American clergyman and author,

We, the People (1903); *New English Ballads* (1903); and *Prayers in the Senate* (1904). He was founder and editor of the journals *The Christian Examiner* and *Old and New*. A collected edition of his *Works* was published in 1901.

Hale, HORATIO (1817-96), American ethnologist and philologist, born at Newport, New

at Rochester, New Hampshire. Sent to Congress as a Democrat in 1842, he in 1843 undertook a vigorous campaign, known as the 'Hale storm,' for the abolition of slavery. He became a senator in 1847, and in 1852 was nominated by the 'Free-soilers' for the presidency, but was not elected. Once more in the Senate from 1855-65, Hale was subsequently United States minister in Spain (1865-9).

Hale, SIR MATTHEW (1609-76), English lawyer and judge, born at Alderley in Gloucestershire. He was a judge in the Court of Common Pleas from 1654—a position which he held till the restoration, when he was made chief baron of the Exchequer, whence he was promoted, in 1671, to the chief seat on the King's Bench. This dignity he resigned from ill-health in 1676. His great work is *Hist. of the Pleas of the Crown* (1682), followed by *Hist. of the Common Law of England* (pub. 1713); but he also wrote *Difficiles Nuge* (1674), *Contemplations, Moral and Divine* (1676), *An Essay on Gravitation of Fluids* (1673), and *Judgment of the Nature of True Religion* (1684). Hale had a strong belief in witchcraft. See *Lives* by Burnet (1682), Roscoe (1838), and Williams (1835).

Hales, ALEXANDER. See ALESIIUS.

Hales, JOHN (1584-1656), English scholar and theologian, known as the 'Ever-memorable,' was a native of Bath. Whilst at the synod of Dort he was converted to Arminianism (1618). His tract on *Schism* (1642) led Laud to appoint him a canon of Windsor. He was ejected for recusancy on the breaking out of the civil war, and spent the remainder of his life in retirement at Eton. His works, comprising sermons and miscellanies, were published under the title of *Golden Remains* in 1659 (best ed. by Lord Hailes in 1765). See *Life* by Des Maizeaux (1719).

Hales, STEPHEN (1677-1761), English physicist and inventor, was born at Beaksbourne in Kent. He wrote treatises on *Vegetable Statics* (1727), *Statical Essays* (1733), *Philosophical Experiments* (1739), and *Electrical Experiments* (1748); and for communications to the Royal Society on dissolving calcoli, and preserving meat during long voyages, he was awarded the Copley medal. In 1741 he constructed a ventilating apparatus, which was used in prisons, hospitals, and ships. His monument is in Westminster Abbey.

Halesowen, mkt. tn. and par., Worcestershire, England, on riv. Stour, 7½ m. S.W. of Birmingham; has manufactures of nails, horn



Right Hon. Richard Burdon Haldane, M.P.

(Photo by Elliott & Fry.)

born at Boston in Massachusetts; held a Unitarian pastorate at Worcester, Massachusetts (1846-56), and from 1856-99 at Boston. Among his numerous publications are *Letters on Irish Immigration* (1832); *The Man without a Country* (1868); *Ten Times One is Ten* (1870); *In His Name* (1873); *Biography of James Freeman Clarke, and Story of Massachusetts* (1891); *J. Russell Lowell and his Friends* (1889);

Hampshire. He accompanied the United States exploring expedition to the Pacific islands, and published the results of his investigations in *Ethnography and Philology* (1846). Among his other publications are *Indian Migrations as evidenced by Language* (1883), and *The Iroquois Book of Rites* (1883).

Hale, JOHN PARKER (1806-73), American statesman, was born

buttons, tools, and ironware. South-west of the town are the remains of a Premonstratensian abbey founded in 1215. The Leasowes, laid out by the poet Shenstone (1714-63), still display his skill in landscape-gardening. Pop. (1901) 4,057.

Halévy, JACQUES FRANÇOIS FROMENTAL ELIE (1799-1862), French operatic composer, was born at Paris, of a Jewish family whose real name was Levi. His first success, and the work by which he is remembered, was *La Juive* (1835), followed six months later by a comic opera, *L'Eclair*. The best of his subsequent operas were *Charles VI.* (1843); *La Reine de Chypre* (1844); *Les Mousquetaires de la Reine* (1846). He was for a long time professor at the Conservatoire, and also published *Leçons de Lecture Musicale* (1857), *Souvenirs et Portraits* (1861), and *Derniers Souvenirs et Portraits* (1863). See *Life* by his brother Léon (1863).

Halévy, JOSEPH (1827), Semitic scholar and Arabian and African explorer, born at Adrianople. He was sent (1868) by the Alliance Universelle Israélite to Abyssinia, to study the religion of the Jewish Falashas; next by the French Académie des Inscriptions (1869-70) to Yemen, in search of Sabæan inscriptions. He is a professor of Ethiopian at the Ecole des Hautes Études in Paris, and has written on Semitic, Berber, Indian, and Babylonian subjects. He founded the *Revue Sémitique* (1893), and published *Rapport sur une Mission Archéologique dans le Yémen* (1872), *Essai sur l'Origine des Écritures Indiennes* (1886), *Nouvel Essai sur les Inscriptions Proto-Arabes* (1903), and *Les Prétendus Mots Sumériens Empruntés en Assyrien* (1905).

Halévy, LÉON (1802-83), French dramatist and poet, brother of Jacques François, was born at Paris, and was only four-and-twenty when a comedy of his, *Le Duel*, was produced at the Théâtre Français. An easy and pleasant style led to the subsequent success of a number of plays, of which the best were *L'Espion* (1828), *Le Czar Démétrius* (1829), *Beaumarchais à Madrid* (1831), *Indiana* (1833), *La Rose Jaune* (1839), *Léone Léoni* (1840), *Un Mari s'il vous plaît* (1843), *Ce que Fille veut* (1858), and *Electre* (1864).

Halévy, LUDOVIC (1834), French dramatist and novelist, son of the preceding, and, like him, a native of Paris. Whilst in the civil service (1852-65) he wrote the librettos for a number of operettas by Offenbach, Delibes, and others. In 1864 began his collaboration, which lasted for seventeen years, with Henri Meilhac. They met

with extraordinary success, their productions being mostly comic operas and *opéras bouffes*, or pieces of the vaudeville type. Among the best known are *Orphée aux Enfers* (1861); *La Belle Hélène* (music by Offenbach; 1865); *Barbe Bleue* (Offenbach; 1866); *La Grande Duchesse de Gêrolstein* (Offenbach; 1867); *La Périochole* (Offenbach; 1868); *Les Brigands* (Offenbach; 1870); *Car-men* (music by Bizet; 1875). They made a first attempt at more serious drama with *Fanny Lear* in 1868, which was followed in 1869 by *Froufrou*, a play which has held the stage ever since. They were also responsible for lighter comedies, such as *Toto chez Tata* (1873), *L'Été de Saint-Martin* (1873), *Le Roi Candaule* (1873), *La Boule* (1875), *Loulou* (1876), *La Cigale* (1877), *Lolotte* (1879), *La Petite Mère* (1880), and *La Roussotte* (1881). Since this partnership ceased Ludovic Halévy has won great success in novel-writing, with *L'Abbé Constantin* (1882), *La Famille Cardinal* (1883), *Criquette* (1883), *Deux Mariages* (1883), *Princesse* (1886), *Karikari* (1892), and *Mariette* (1893). In 1884 he was elected to the French Academy. *Le Théâtre de Meilhac et Halévy* was published in 1900-2, etc. See Halévy's *Notes et Souvenirs* (1889).

Half-blood. Relatives of the half-blood descend from the common ancestor (male or female) by different marriages. Before the Inheritance Act, 1833, they could not inherit land in England or Ireland from their half-blood relations, but they now take 'next after any relation in the same degree of the whole-blood.' In intestate successions to personal estate, brothers and sisters of the half-blood rank equally with those of the whole-blood. In Scotland consanguinean relatives of the half-blood—i.e. relatives descended from the same father—take after relatives and the descendants of relatives of the whole-blood. Uterine relatives of the half-blood—i.e. relatives descended from the same mother—formerly took neither movables nor immovables; but by the Movable Succession Act, 1855, the uterine brothers and sisters or their descendants take half the movable estate if the intestate has died without issue, parents, or brothers or sisters german or consanguinean.

Half-pay, in the British army. The commonest occasion of an officer being placed on half-pay is when he is promoted to one of the higher ranks and no vacancy exists for employment at the time. Officers, with certain exceptions, who have become medically unfit through military service, or through ill-health con-

tracted in the service, may be placed on half-pay for five years, at the end of which time, if still unfit for duty, they must retire. A colonel or lieutenant-colonel may be placed on half-pay at his own request.

Haliartus, an ancient Boeotian town in Greece, s. of Lake Copais; was destroyed in 480 B.C. by Xerxes. In a battle fought near it in 395 B.C., between the Spartans and Boeotians, Lysander was killed.

Haliburton, THOMAS CHANDLER (1796-1865), Nova Scotian judge, born at Windsor in that colony; became a judge in 1828, and a judge of the supreme court in 1842. Under the pen-name of 'Sam Slick' he wrote some racy books, making a skilful use of the American dialect—e.g. *The Clockmaker*, or *Sayings and Doings of Sam Slick of Stickville* (1837-40); *The Attatché*, or *Sam Slick in England* (1843-4). His more serious work consists of histories of his native province (1825-9), and accounts of the government of his country—e.g. *The Bubbles of Canada* (1839). See *Memoir* by F. Blake Crofton (1889).

Halibut (*Hippoglossus vulgaris*), the largest member of the family of flatfishes, sometimes attaining a length of eight feet, but usually ranging from two to six feet. It is distinguished by its long, narrow, thick body, eyes on the right side, large mouth, and dark olive back. It is a northern fish, extending as far south as the English Channel, most abundantly in deep water. It lives mostly on other fishes, and spawns in spring, producing from one to five or six million eggs, which are buoyant or pelagic and relatively large (one-sixth of an inch). Halibut is chiefly caught by lines, but also by trawls. The value of the halibut landed in Great Britain is over £300,000.

Halicarnassus, a Dorian colony in Asia Minor, on a promontory in Caria, opposite the island of Cos. It became subject to Persia during the 6th century B.C., and Lygdamis founded in the city a tyranny which lasted for several generations. During the 4th century B.C., a line of Carian princes, of whom the chief was Mausolus, made it their residence, and adorned it with the Mausoleum. In 334 B.C. the town was captured by Alexander the Great. It is famous as the birthplace of Herodotus and Dionysius, the historians. See Newton's *Discoveries at Halicarnassus*, etc. (1862-3).

Halicz, tn. in the crown land of Galicia, Austria, on the r. bk. of the Dniester, 60 m. s.s.e. of Lemberg. Salt and soap are manufactured. Pop. (1900) 4,809.

Halidon Hill, Northumberland, England, 2½ m. N.W. of Berwick, was the scene of a battle in 1333, when Edward III. of England routed the Scottish army.

Halifax. (1.) Munic., co., and parl. bor., W. Riding, Yorkshire, England, on the Calder, 16 m. S.W. of Leeds. The parish church of St. John (12th century), town hall, public library and museum, Akroyd museum and art gallery, mechanics' institution, the piece or cloth hall (1779), two grammar, municipal, technical, and other schools, the Crossley and Porter Orphan Home and School, are the chief buildings and institutions. There are several fine public parks. The town owes its importance to the woollen and worsted industries, the former introduced about 1414. Carpets are extensively manufactured.

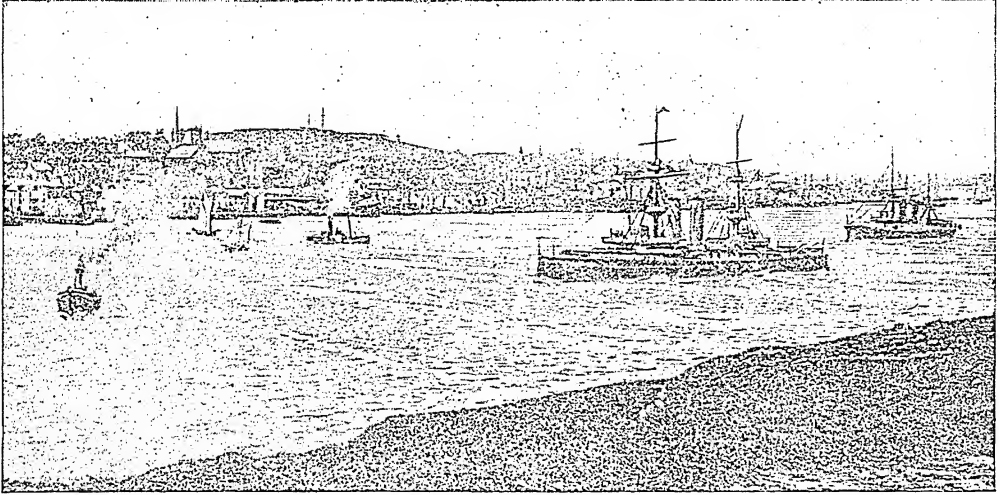
(pop. 4,806 in 1901), finely situated on the opposite side of the harbour, is a suburb of Halifax.

Halifax, CHARLES LINDELEY WOOD, VISCOUNT (1839). Since 1867 he has been president of the English Church Union. As leader of the extreme High Church party, he in 1895 visited Rome, where he sought to obtain recognition of the validity of Anglican orders and sacraments. His self-imposed mission bore, however, no practical fruit, though it produced a letter from the Pope to the English people, another on Anglican orders and sacraments denying their validity, a rejoinder from the archbishops of Canterbury and York, and a prolific newspaper correspondence.

Halifax, CHARLES MONTAGU, EARL OF (1661-1715), English

finance, and a patron of letters. His most notable literary achievement was. (in co-operation with Matthew Prior) a parody on Dryden's *Hind and Panther*, called *The Story of the Country Mouse and the City Mouse* (1687).

Halifax, GEORGE SAVILE, MARQUIS OF (1633-93), English statesman, born at Thornhill, Yorkshire. Representing Pontefract in 1660, he was made Baron Savile and Viscount Halifax (1668) for his share in the restoration. He was the chief opponent of the bill excluding the Duke of York from the succession, and was made marquis and Lord Privy Seal (1682-5). He resumed the Privy Seal (1689) under William III., but was forced to resign (1690). He was an impressive orator, but his vacillation earned him the nickname of 'trimmer'—a



Halifax, Nova Scotia, with British Warships in Harbour.

The borough returns two members to the House of Commons. Pop. (1901) munic. bor. 104,933; parl. bor. 88,909. See **HALIFAX LAW**. (2.) Capital, fort. tn., and seapt. of Nova Scotia, on the E. coast. Halifax has a fine harbour (6 m. long and 1 m. broad), on Chebucto Bay, with outfitting yards and graving dock, and was, till September 1905 the only point in Eastern Canada garrisoned by British regulars. The defence has been taken over by the Canadian government. Halifax is the Atlantic terminus of the Intercolonial Railway of Canada. The value of its export trade was £1,840,650 in 1904, and of its import trade £1,693,212. Halifax is the banking centre of the maritime provinces of Canada. Sugar-refining and steel shipbuilding are carried on. Pop. (1901) 40,832. Dartmouth

statesman and poet, born at Horton in Northamptonshire. He became Lord of the Treasury (1692), and a year later created the National Debt by raising a loan of £1,000,000. In the following spring, acting on Paterson's idea, he instituted the Bank of England, with a capital of £1,200,000. For this service he was appointed (1694) Chancellor of the Exchequer. In 1695 he carried out a reform of the coinage, and two years later became First Lord of the Treasury. In 1699 he was forced to retire to the Lords as Baron Halifax, and accept the auditorship of the Exchequer. He was impeached by the Commons for breach of trust (1701 and 1703), but was protected by the Lords. On the accession of George I. he was again made premier. He was a great parliamentary orator and minister of

name he adopted and defended in his *Character of a Trimmer* (1689).

Halifax Law. The inhabitants of the forest of Hardwick (Yorks) had by immemorial custom a right to try, and hang forthwith, a felon taken within the forest with stolen goods in his hands. The last execution took place in 1650.

Haliotis, genus of gastropods to which belongs the 'ormer' or ear-shell of the Channel Is. Most of the species are tropical or subtropical forms, and are valued for their beautiful shells, which furnish mother-of-pearl. The shell is ear-shaped and depressed, with a small spire and a large body-whorl, pierced by a number of holes, through which in life the water used in respiration passes. The foot is very large, and the animal clings to the rocks with great tenacity. In the

Channel Is., as in other regions in which the species occur, the animals are largely consumed as food.

Hall, in architecture, is used in at least four distinct senses: (1) the chief apartment of a feudal castle, and later of a town mansion or country manor-house, also of a college, inn of court, or guild; (2) a town, or more often a country, mansion of size and importance; (3) any large room in a public building, or large room used for public entertainments; (4) the room serving as vestibule in a public building, or by analogy the entrance-room or passage in a private house. The palace of the Saxon kings consisted primarily of a hall,

separate and detached. Along the two long sides were rows of raised benches, with a 'high seat' in the middle. On the walls behind the warriors hung their shields and weapons. In fact, the 'hall' was the focus of the home life of the viking.

Hall. (1.) SCHWÄBISCH-HALL, tn., Württemberg, Germany, on the Kocher, 34 m. by rail E. of Heilbronn. It provides saline baths and waters. Pop. (1900) 9,225. (2.) Town and health resort of Austria, prov. Tyrol, on the Inn, 6 m. by rail E. of Innsbruck; produces salt; is visited for its saline waters. Pop. (1900) 6,191. (3.) Watering-place in the Austrian prov. of Upper Austria, 25 m. by rail S. of Linz. Its

at Edinburgh. In 1816 he accompanied Lord Amherst's embassy to China, and wrote *Account of a Voyage of Discovery to the West Coast of Corea*, etc. (1818). In 1820 he published *Extracts from a Journal written on the Coasts of Chili, Peru, and Mexico*. His other books include *Travels in North America* (1829), *Spain and the Seat of War in Spain* (1837), and *Fragments of Voyages and Travels* (9 vols. 1831-40), besides numerous scientific and miscellaneous works. His last years were clouded by insanity, and were spent in Haslar Hospital.

Hall, CHARLES FRANCIS (1821-71), American Arctic explorer, born at Rochester, New Hampshire. After a journalistic career,



Westminster Hall: the finest example of an old English Hall.

originally of wood. In a Norman castle the hall occupied the whole first floor of the keep, the dwelling apartments being above. Later, in the 12th and 13th centuries, larger and more convenient halls were built in the inner bailey. Their general plan was an oblong apartment, vaulted or roofed with wood. At the upper end was a raised dais, where the lord and his family dined, the retainers occupying the rest of the room. The finest example in England is Westminster Hall (300 x 100 ft.). The central feature of the dwelling of the ancient Scandinavians in viking times was the large hall, built of wood, from which the other apartments generally stood

saline waters have been known for more than a thousand years. Pop. (1900) 1,000.

Hall, ANNA MARIA (1800-81), Irish novelist and author, a native of Dublin, married in 1821 S. C. Hall. Her novels—*The Buccancer* (1832), *The Outlaw* (1835), *Uncle Horace* (1837), *Marian* (1840), *The Whiteboy* (1845)—and her miscellaneous writings—e.g. *Sketches of Irish Character* (1829-31) and *Lights and Shadows of Irish Life* (1838)—give vivid pictures of her native land. She was deeply interested in temperance and the wrongs of women. See S. C. Hall's *Retrospect of a Long Life* (1883).

Hall, BASIL (1788-1844), British naval officer and explorer, born

he started (1860) in a whaler in quest of Sir John Franklin. When icebound, Hall lived with the Eskimos near Frobisher Bay, and this experience led to his *Arctic Researches* (1865) and *Life with the Esquimaux* (1864). Subsequently he made a second expedition (1864-9), in which he learned definite and reliable news of the fate of two-thirds of Franklin's party. In 1871, in the *Polaris*, Hall proceeded on a third Arctic voyage, making his way along Smith Sound until stopped in lat. 82° 16' N., the highest hitherto reached; but he died after a sledge journey northwards. An official *Narrative of the Second Arctic Expedition* was published in 1879.

Hall, CHESTER MOOR (1703-71), English optician, belonged to the family of Hall of Leigh, Essex, where he was born. He became a bencher of the Inner Temple (1763), and is known as the inventor of the achromatic telescope (1733).

Hall, CHRISTOPHER NEWMAN (1816-1902), English Congregational minister, born at Maidstone; became minister of Albion Chapel, Hull, but was called to Surrey Chapel, Blackfriars Road, London (1854), and became a popular preacher. His new church in Kennington Road, Lambeth (largely contributed to by Americans), was opened in 1876. He resigned his pastorate in 1892. See *Autobiography* (1898); *Congregational Year Book* (1903).

Hall, EDWARD (c. 1499-1547), English chronicler, was a hearty supporter of Henry VIII., although allied to the advanced reforming party. The doctrine of 'royal supremacy' he uncompromisingly taught in *The Union of the Two Noble and Illustrious Families of Lancaster and York* (1542; best ed. 1809). This work is the source upon which Shakespeare drew for some of his historical plays.

Hall, JAMES (1811-98), American geologist, born at Hingham, Massachusetts. Appointed to the Geological Survey of New York in 1837, he was almost immediately placed in charge of the survey of the western part of the state. His report, published in 1843, led to the founding of the office of state geologist, Hall receiving the appointment. He made geological surveys of Wisconsin and Iowa, also in Canada. His chief work is *Paleontology of New York* (5 vols. 1847-79).

Hall, JOSEPH (1574-1656), English satirist and divine, was born at Ashby-de-la-Zouch, Leicestershire. An attack on him by Marston led to the burning of the books of both disputants in 1599. In 1608 he was made chaplain to Prince Henry, and obtained the living of Waltham, Essex; in 1616 he became dean of Worcester, and in 1618 was deputy to the synod of Dort. In 1627 he obtained the bishopric of Exeter. His ecclesiastical policy was that of Charles I. and Laud. An attack on him by five Puritans, under the joint pseudonym of 'Smectymnuus', in 1640, brought him into polemical conflict with Milton. In 1641 he was translated to Norwich. Under the Long Parliament he suffered imprisonment and expulsion, and retired to Hingham, near Norwich (1647), where he died. *Poems*, ed. Singer (1824), ed. A. B. Grosart (1879); *Meditations*, ed. C. Sayle (1902); *Collected Works*, ed. J. Pratt (1808), ed. P. Hall (1837-9), ed. P.

Wynter (1863). There is a *Life* by G. Lewis (1836).

Hall, MARIE (1884), English violinist, born at Newcastle-on-Tyne, one of the greatest executants of the present day. She made her first appearance at St. James's Hall, London, in February 1903.

Hall, MARSHALL (1790-1857), English physiologist, born at Basford in Nottinghamshire; practised medicine in Nottingham (1817-26) and London (1826-53), being Goulstonian (1842) and Croonian (1850-2) lecturer. His claim to distinction rests upon his studies in the normal and pathological reactions of the nervous system. He wrote *Diseases and Derangements of the Nervous System* (1841); *On the Threatenings of Apoplexy* (1851). See *Memoirs* by his widow (1861).

Hall, OWEN—pen-name of JAMES DAVIS (?1848)—English dramatic author, was editor of two defunct journals, the *Bat* (1885-7) and the *Phoenix* (1899). Thereafter he began writing musical trifles and comic opera, and is author of the popular *Artist's Model* (1895), *The Gaiety Girl* (1896), *The Geisha*, *A Greek Slave*, *Florodora*, *The Silver Slipper*, *The Medal and the Maid*, *The Girl from Kay's*, and was part author with J. T. Tanner of *All Abroad*. He has also written four novels—*The Track of a Storm*, *Jetsam*, *Eureka*, and *Hernando* (1902).

Hall, ROBERT (1764-1831), English Baptist preacher, born at Arnesby, Leicestershire, began his ministerial career at Broadmead Chapel, Bristol (1785), but afterwards removed to Cambridge (1790-1806). Eventually his views underwent a change, and his preaching, though still eloquent and able, became more decidedly evangelical during his ministry at Leicester (1807-25) and Bristol (1826-31). See *Memoir* by Gregory in collected edition of *Works* (1832).

Hall, SAMUEL CARTER (1800-89), British editor, was born near Waterford, and became editor of the *Art Journal* (1839-80), founded by him. He edited and (along with his wife) wrote numberless volumes on Irish antiquities and customs, also *Book of British Ballads* (1842) and *Memoirs of Great Men and Women* (1871). See his *Retrospect of a Long Life from 1815-83* (1883).

Hallam, ARTHUR HENRY (1811-33), English poet, son of Henry Hallam, the historian, was born in London. His early death inspired Tennyson's noble elegy of *In Memoriam*. His *Remains in Prose and Verse* were edited by his father, with *Memoir*, in 1834.

Hallam, HENRY (1777-1859), English historian, born at Wind-

sor, of which his father held a canonry, and educated at Eton and Christ Church, Oxford; was called to the bar, but never practised, devoting himself to literary work, and writing articles for the *Edinburgh Review*. From the Whig party he obtained an office in the Stamp Department, which, with a small private fortune, made him equally independent of law and literature. Among his great works are *View of the State of Europe during the Middle Ages* (1818), *The Constitutional History of England from the Accession of Henry VII. to the Death of George II.* (1827), and *Introduction to the Literature of Europe in the Fifteenth, Sixteenth, and Seventeenth Centuries* (1837-39). In 1834 he also edited a volume by his eldest son, who died in 1833, entitled *Remains in Prose and Verse of Arthur Henry Hallam*. He was a careful, laborious, and critical investigator, and a cool and judicious critic, with a sound, vigorous literary style.

Hallamshire, anc. lordship, W. Riding of Yorkshire, England. It gives its name to one of the parliamentary divisions of Yorkshire.

Halle, or HALLE-AN-DER-SAALE, tn., Prussia, prov. Saxony, 21 m. by rail n.w. of Leipzig. It is the seat of a famous university, founded in 1694, and conjoined with the University of Wittenberg in 1817. For many years it was the stronghold of pietistic theology. It is attended by some 1,750 students. Here are the asylums and schools founded (1698) by Francke. In the market-place are the red tower (276 ft.), and a monument to Handel, a native of the town. The handsomest church is that of St. Maurice (12th to 16th century). Halle possesses also a cathedral (16th century). The most notable of the secular buildings are the (partly ruined) citadel of St. Maurice (1484-1503), formerly a residence of the archbishops of Magdeburg; the ruined castle of Giebichenstein; and the university (1834). Halle has engineering works, sugar factories, printing works, malt-kilns, and manufacture of confectionery, oils, chicory, and salt. Pop. (1905) 169,899.

Hallé, SIR CHARLES (1819-95), Anglo-German pianist, born at Hagen in Westphalia, and passed nearly all his public life in Britain, where he was closely identified with the development of chamber music in London from 1852, when the Quartet Association was founded. For many years a favourite performer at the Monday and Saturday, the Crystal Palace, and other London concerts, he was one of the

earliest artists to arrange piano recitals. In 1857 began his connection with Manchester, when he was appointed director of the gentlemen's concerts; in 1893 he became first principal of the Royal College of Music there. His band ranked among the best in the world. His son, CHARLES L. (1846), is a well-known portrait and subject painter, and director of the New Gallery.

Hallé, LADY, i.e. MADAME WILMA NORMANN-NERUDA (1839), Anglo-Austrian violinist, played at a Philharmonic concert, London, in 1849, and again—after visiting France and Russia—in 1869. From this time onwards her chief successes were gained at the Saturday and Monday Popular and Crystal Palace concerts, where she was associated with Sir Charles Hallé, whom she married in 1888. In England she had a reputation almost equal to that of Joachim, and in 1901 Queen Alexandra appointed her court violinist.

Halleck, FITZ-GREENE (1790-1867), American poet, born at Guilford, Connecticut. He was for twenty years a clerk in a New York bank, and afterwards became private secretary to John Jacob Astor. He published the satirical series 'The Croakers' in the New York *Evening Post* (1819), and *Fanny* (1819), a satiric poem. His best poems are those on *Albion Castle* and *Burns*. Poems, eds. 1858 and 1869. See *Life and Letters*, by J. G. Wilson (1868-9).

Halleck, HENRY WAGER (1815-72), American general, born at Westerville, New York; was employed as a military engineer on the fortifications of New York (1841-6). In the latter year he delivered at Boston a series of lectures on the 'Elements of Military Art and Science,' which were largely used as a text-book during the civil war. In 1847-8 he saw service in Mexico, and was employed in administrative offices in California, being in 1849 a member of the committee which drafted the state constitution. In 1862 he was made commander-in-chief of the Federal forces, but in 1864 he resigned that position to Grant, to whom he acted as chief of the staff. He wrote *International Law* (1861; 3rd ed. 1893) and other works. See *Life* by G. W. Cullum.

Hälleflinta, a fine-grained yellow, brown, or red rock, usually marked by a fine parallel banding, compact flinty texture, and great hardness. It consists of very small particles of quartz and felspar, with sometimes chlorite, muscovite, iron ores, and other minerals as accessory constituents. The rock is most common in regions of crystal-

line schist and gneiss, such as form the interior of Sweden. It is probably a metamorphosed felsite.

Hallelujah, a word which forms part of the praises both in Jewish and in Christian liturgies. Psalms 113-118 are known as the great hallelujah, and were sung by the Jews at the Passover feast. In the Book of Common Prayer of 1549 'Alleluia' was inserted after the first Gloria Patri at matins and evensong, to be said from Easter to Trinity Sunday. The Prayer Book of 1552 substituted the translation 'Praise ye the Lord,' with the response 'The Lord's name be praised.'

Haller, ALBRECHT VON (1708-77), German poet, physiologist, and botanist, born at Bern. He was appointed professor of medicine at Göttingen (1736), but retired to Bern (1753). His descriptive poem *Die Alpen* (1729), and his didactic poem *Vom Ursprung des Uebels* (1734), did much to substitute real feeling for the arid platitudes which passed for German poetry. Of his scientific works the most important is *Elementa Physiologie Corporis Humani* (1757-66); in addition to this he also wrote *Icones Anatomice* (1743-50), *Opuscula Pathologica* (1753), *Opuscula Botanica* (1749), and *De Functionibus Corporis Humani Præcipuarum Partium* (1777-8). See *Life*, in German, by J. G. von Zimmermann (1775) and by Frey (1879).

Hallett, HOLT S. (1845), English railway engineer and author, was born in London; entered the Indian Public Works Department (1868), his sphere of labour being mainly in Burma. He retired in 1880. He outlined the connection between the Indian and Burmese railway systems (since adopted), 1881-2; proposed railway connection between Burma and China, and explored the route (1883-4); visited China and reported on Chinese railway prospects during the Franco-Chinese war; and organized and led the movement for improving Indian factory legislation (1890-2). He has written *A Thousand Miles on an Elephant* (1890), *Development of our Eastern Markets* (1890), etc.

Halley, EDMUND (1656-1742), English astronomer, was born at Haggerston, London. His stellar observations at St. Helena in 1676 earned him the title of the 'Southern Tycho,' and he promoted the publication of Newton's *Principia*. In 1698-1700 he investigated the variation of the compass in the Atlantic, and inferred the magnetic relations of auroras from his observations of the display on March 16, 1715. He predicted, in 1705, the return in 1759 of the comet of 1682; advocated the determination of

the solar parallax by transits of Venus; detected the 'long inequality' of Jupiter and Saturn, and the motions of the stars. He was appointed Savilian professor of astronomy at Oxford in 1703; and having succeeded Flamsteed as astronomer-royal in 1721, he carried out at Greenwich a long-cherished design of observing the moon throughout an eighteen-year period.

Hallgrímsson, JONAS (1807-45), Icelandic poet and critic, who spent most of his life after 1832 in Denmark. He was one of the small band of writers who through the journal *Fjölnir*, and by his own poems and critical papers, effected the modern reformation of Icelandic poetry. Hallgrímsson's principal poem, *Gunnarsholmi*, has been translated into English by D. Leith (1897).

Halliwell, afterwards **HALLIWELL-PHILLIPPS, JAMES ORCHARD** (1820-89), English Shakespearean scholar, was born at Chelsea, London. He published a *Dictionary of Archaic and Provincial Words* (1847; 11th ed. 1889) and *Letters of the Kings of England* (1848), followed by reprints, in very limited editions, of rare tracts. His fame, however, rests on his Shakespearean scholarship. He edited sixteen annotated volumes, with critical apparatus, of the folio edition (1853-65), still the standard for critics, and forty-eight volumes of lithographed facsimiles of Shakespearean quartos (1862-71). In 1881 he published *Outlines of the Life of Shakespeare*, greatly enlarged in later editions. See Justin Winsor's *Halliweliana* (1881).

Hall-marks. See **SILVERSMITHS' WORK.**

Halloween, HALLOWEEN, or ALL HALLOWE'EN, the popular name for October 31, the vigil of the feast of All Saints, otherwise All Hallows. In Roman Catholic countries Halloween is the occasion for visiting the cemeteries and laying flowers on the graves of friends and relatives. In Scotland and England the night is devoted to merry-making and divination of the future.

Hallstatt, mkt. tn., on w. shore of the lake of the same name, Upper Austria, near the border of Salzburg. Its necropolis, with Celtic remains, has given its name to the Hallstatt period, the final stage of the bronze age and first stage of the iron age in Europe.

Hallström, PER (1866), Swedish author, born at Stockholm; entered the Swedish post office, but since 1897 has lived by his pen. Hallström is one of the finest of modern Swedish stylists; his novels show also humour and pathos. His view of life, generally, is idealistic, with a touch of

humour. Chief works: *Vilsna Fåglar* (1894); *Purpur* (1895); *En gammal Historia* (1895); *Våren* (1898); *Grefven af Antwerpen* (1899); *Thanatos* (1901); *Döda Fallet* (1902); *Gustaf Sparfverts* (1903); and *Skogslandet* (1904).

Hallucination has been defined as 'perception without an object'—i.e., there is consciousness of an apparently external object when no such object exists. In illusion, on the other hand, a sensory object is present, but it is interpreted as something else. In the great mass of hallucinations there is some element of illusion, and *vice versa*. Many forms of insanity are characterized by hallucinations; which also occur in dreams, delirium, poisoning by certain drugs, extreme hunger or starvation, in the hypnotic state, insanity, etc. (See HYPNOTISM.) The English and American Societies for Psychical Research have collected examples of hallucination in the 'waking' state. These facts have given occasion for various theories to account for alleged 'veridical' hallucinations, i.e. hallucinations associated with and supposed to be caused by actual occurrences—e.g. the coincidence of a friend's death with the appearance of his 'phantasm.' Before, however, the facts collected can form the groundwork of a theory, they demand further critical analysis. Hallucinations may vary in definiteness from the passing visualization of a suggested object to the impressive reality of the images in delirium. The condition precedent of all forms of hallucination is partial or total dissociation of consciousness. (See DREAMING.) In the cerebral cortex certain centres normally work in association with others, all being capable of stimulation by sensory stimuli. If some of the association-paths between centres are blocked, as in fatigue, or sleep, or disease, or poisoning, the excitements in one centre will radiate into unusual paths, and so excite centres not usually excited from these paths. The perception thus aroused, however, will naturally be referred to the ordinary sensory stimulus, and the result is a 'virtual perception' or hallucination. There is a disturbance of the normal relation between the central and peripheral nervous elements (Baldwin). The explanation of an illusion is fundamentally the same, except that there is an actual sensory stimulus, which, acting feebly on its centre, does not excite the associated centres usually so excited—the result being misinterpretation of the sensory stimulus. See Pierre Janet and Raymond's *Névroses*

et *Idées Fixes*—'hallucinations in hysteria' (1898); W. Bevan Lewis's *Text-book of Mental Diseases*—'hallucinations in insanity' (1889); Podmore's *Studies in Psychological Research* (1897), and *Modern Spiritualism* (1902); Parish's *Hallucinations and Illusions*.

Halluin, tn., dep. Nord, France, 13 m. N. of Lille, on the Belgian frontier; has distilleries, foundries, and cotton and flax factories. Pop. (1901) 16,500.

Halmahera, E. Indies. See JILOLO.

Halmstad, tn., Halland co., Sweden, on the Kattegat, 76 m.

holiness, and symbolized the heavenly glory which emanated from them. As a rule, the halo is circular, sometimes is formed of concentric circles, and sometimes is indicated by a single line; but occasionally it is represented by rays diverging from the head. A triangular or cruciform halo often distinguished one of the three persons of the Trinity, and a square halo was used to mark a person living at the time the work was executed. When a glory surrounds the whole figure, as it only does those of Christ and the Virgin, or of saints represented



The Halo, or Nimbus, in Christian and Pre-Christian Art.

S.E.E. of Gothenburg. The town manufactures clothes, beer, and machinery. Here, in August 1676, Charles XI. routed the Danes. Pop. (1900) 15,362.

Halo, or **NIMBUS**, used in Christian art as the symbol of sanctity, had a pagan origin. In the East the halo was regarded as 'the attribute of power,' and as such it figures in Byzantine art in representations of Satan and other great powers of evil; but in the West, from about the 5th century, when it became a part of Christian symbolism, it was used to indicate persons of exceptional

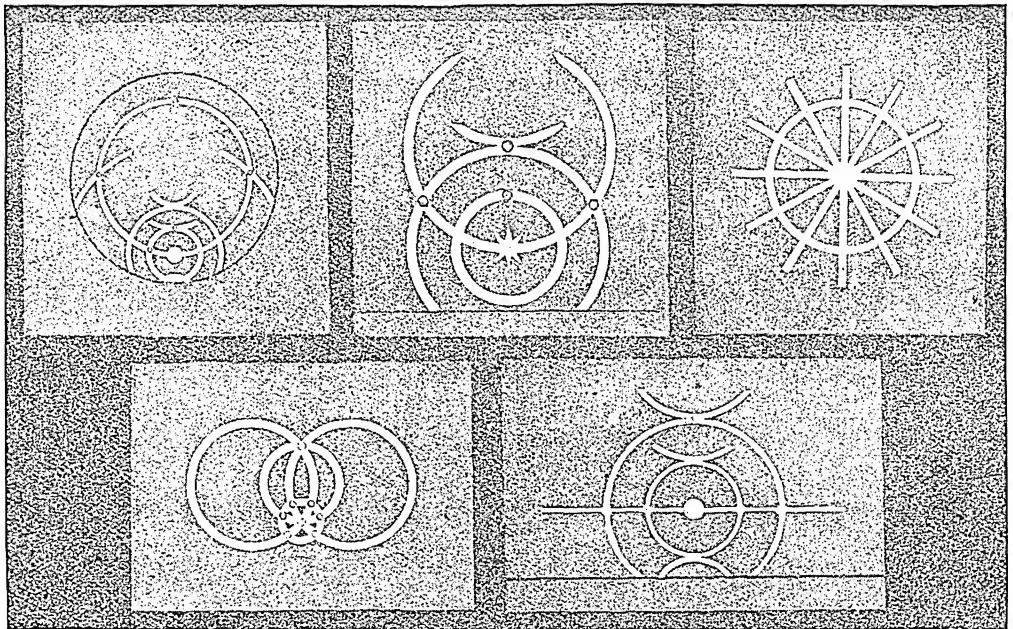
as ascending into heaven, it is called an 'aureole.'

Halo, in meteorology, a coloured ring, with the red inside, surrounding the sun or moon, is due to the refractive power of ice crystals in the air. The smaller circular bands of spectral colours, with the red outside, are known as 'coronæ,' and are due to the light passing through very minute globules of water. Sir Isaac Newton attributed halos to 'some sort of hail or snow floating in the air in a horizontal position, the refracting angle being about 58° or 60°.' Subsequent research has

shown that this is substantially correct, and the only difficulty in the explanation of halos and mock suns or moons arises from the complicated perspective involved. An example of the common halo is shown in diagram below, where *HH* is the horizon, *Z* the zenith, and *S* the position of the sun. The circle *BAC*, having the sun for its centre, is called the halo of 22° , because its semi-diameter is an arc of 22° of a great circle of the heavens. The prismatic colours are in the order of

dicular to the plane in which the sun, the eye, and the crystal are situated, while the halo of 46° is produced by crystals having their axes lying in this plane. This observation is of considerable importance in the explanation of mock suns or moons. Crystals thus placed, when rotated further about their axes into the position producing minimum deviation (see *LIGHT*), form a series of images of these bodies, all at the same distance, and there coalescing give rise to the two circles of

the sun is accounted for by reflection from the vertical faces of the ice crystals. Owing to the absence of refraction, no prismatic effect is produced; the vertical band of white light or 'sun pillar' passing through the sun is similarly due to the reflection from the horizontal flat sides of crystals having their axes vertical. See Cherrill's *The Theory of Halos and Parhelia*; Symons's *Meteorol. Mag.*, vol. xxvi., pp. 49 and 69; and Thomson's *Introduction to Meteorology*, pp. 229-246.



Various forms of Halo.

red inside, or next to the sun, and the violet outside, the intermediate hues being usually faint or absent, so that the appearance presented is that of two separate bands. The halo of 46° is shown by the larger circle *GEDFK*. The parhelic circle or band of white light passing through the sun is indicated by the letters *GBSCK*; while *EAH* and *ZDM* are prismatic arcs, the colours of which are brighter than those of the circles. Parhelia, or mock suns, are usually seen at or near the points *B* and *C*, where the inner circle is crossed by the white band; and they may also be seen at some other points. There is sometimes observed a vertical band of white light in the direction *DAS*. In the Orkneys this is known as a 'sun pillar,' and is rarely visible except after sunset or before sunrise. The prisms that give rise to the halo of 22° must have their axes perpen-

dicular to the plane in which the sun, the eye, and the crystal are situated, while the halo of 46° is produced by crystals having their axes lying in this plane. This observation is of considerable importance in the explanation of mock suns or moons.

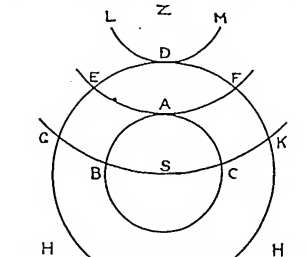


Diagram of Halo.
(For explanation, see text.)

les Halos (in *Jour. de l'Ecole Polytech.*, Paris), are formed by refraction through crystals having their axes vertical. The horizontal white band passing through

the sun is accounted for by reflection from the vertical faces of the ice crystals. Owing to the absence of refraction, no prismatic effect is produced; the vertical band of white light or 'sun pillar' passing through the sun is similarly due to the reflection from the horizontal flat sides of crystals having their axes vertical.

Hals, DIRK (1589-1656), Dutch artist, younger brother of Frans Hals, born and died at Haarlem. He painted social pictures—viz. young people, with figures of small dimensions, assembled at dinner, dancing, talking, or listening to music. His works have of late become more valued.

Hals, FRANS (1580-1666), Dutch portrait painter, born at Antwerp, but settled in Haarlem (1616). In the Dutch school he was the pioneer of free, broad brush-work; famous also for his masterly juxtaposition of flesh-tints. His finest portrait groups of *Companies of Archers*, of *Civic Guards*,

are in the Haarlem Museum; but good examples of his portraiture are in the Louvre, the Wallace Collection, and the National Gallery, London. See Davies's *Franz Hals* (1904).

Halsbury, HARDINGE STANLEY GIFFARD, EARL OF (1825), Lord High Chancellor of England from 1895 to 1905. He was first appointed to this office in Lord Salisbury's short-lived administration (1885-6), then in his second government (1886-92), again in the Unionist government (1895-1900), and in the reconstructed ministry (October 1900), and, finally, in Mr. Arthur Balfour's first administration (1902-1905). He was raised to the peerage as Baron Halsbury in 1885, and was created an earl in 1898. He entered the Inner Temple (1850), took silk (1865), and sat in the House of Commons for Lancashire from 1877 to 1885. Disraeli appointed him solicitor-general in 1875, and he filled that office until the defeat of the government in 1880. Perhaps the most interesting and powerful of his judgments was that given in the appeal to the House of Lords by the Free Church of Scotland against the United Free Church (1904).

Halstead, or HALSTED, tn., Essex, England, 14 m. N.W. of Colchester; has a silk and craps factory. Pop. (1901) 6,072.

Halfwhistle, mrkt. tn., Northumberland, England, on the S. Tyne, 16 m. W. of Hexham. The Roman wall of Hadrian and Severus runs within 1½ m. of the railway station. Produces coal and clay. Pop. of tn. and dist. (1901) 8,500.

Halyburton, THOMAS (1674-1712), Scottish theologian, born at Dupplin, near Perth; went to Rotterdam (1682). After his return to Scotland he became professor of divinity at St. Leonard's College, St. Andrews (1710). His theological writings, directed chiefly against the deists, are now forgotten, but his name is still cherished for the spirituality of his Autobiography (in works, 1835). See *Halyburton's Memoirs* (1714).

Halys. See KIZIL IRMAK.

Halysites (*Catenipora*), a genus of fossil chain corals found in the Palaeozoic rocks of Europe, N. America, and Australia. In cross section the mass shows a characteristic chainlike appearance; hence the name.

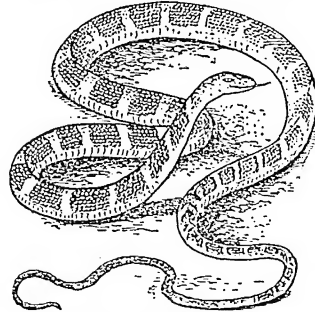
Ham, according to Gen. 5:32, 10:6 f., one of the three sons of Noah, and the ancestor of one of the three great families of mankind—viz. the Hamitic. This includes the Ethiopians (Cush), the Egyptians (Mizraim), the Libyans (Phut), and the Canaanites (Canaan). This division, how-

ever, is destitute of ethnological validity. Philologists still apply the term Hamitic to a family of languages spoken in this region (Egyptian, Ethiopic, Berber, and their numerous dialects), which, however, exhibit considerable resemblances to the Semitic tongues, and are often grouped with them under the designation Hamito-Semitic.

Ham, tn., dep. Somme, France, 35 m. S.E. of Amiens, on canal Oise-Somme. Its mediæval castle is now a prison. Here Louis Napoleon (Napoleon III.) was confined from 1840 to 1846. Pop. (1901) 3,300.

Ham, (1.) WEST, parl. co. and munic. bor., Essex, England, on N. bk. of the Thames. In recent years the population has greatly increased owing to the development of the Victoria and Albert docks and the Great Eastern Railway works. There are manufactures of iron, india-rubber, gutta-percha; also ship-building yards, sugar refineries, and soap and jute works. The borough has a fine town hall and municipal buildings, and is notorious for its high rating, due to the excessive rates necessary for educational and poor law purposes (5s. 8d. in the pound in 1905-6). It returns two members to the House of Commons. Pop. (1901) 267,358. (2.) EAST, munic. bor., S.W. Essex, England, 1½ m. S.W. of Barking; has chemical factories and distilleries. Pop. (1901) 95,999.

Hamadan, tn. in W. of prov. Irak-Ajemi, Persia, near Mount Elvend, 185 m. S.W. of Teheran; has manufactures of leather, carpets, silks, copper work. It is supposed to stand on the site of the ancient Ecbatana, and among its tombs the Jews still show the reputed burial-places of Esther and Mordecai. Pop. about 30,000.



Hamadryad, or Giant Cobra.

Hamadryad, or KING COBRA, or GIANT COBRA (*Naja bungarus*), a large and very poisonous snake, found in India, S. China, and the Philippines. It may reach a length of twelve feet or more, and apparently lives entirely on

other snakes. The colour is yellowish, with more or less distinct black cross-bands. It is distinguished from the common Indian cobra by the size and the arrangement of the scales.

Hamadryad. See NYMPHÆ.

Hamah. See HAMATH.

Hamann, JOHANN GEORG (1730-88), German author, known from the oracular character of his writings as the 'Magus of the North,' was born at Königsberg, in E. Prussia; tried various callings, but never mastered any. His writings are like his life, desultory, and without plan or fixity of purpose; but owing to their love of truth, their religious and moral earnestness, and their fullness of literary allusion, were not without influence upon men of the rank of Herder, Jacobi, and Jean Paul. See Claassen's *Hamanns Leben und Werke* (1885).

Hamar, tn., Norway, co. Hede-mark, on Lake Mjøsen, 65 m. N.E. of Christiania; remade a bishopric in 1864. It has a milk-condensing establishment, metal workshops, breweries, and iron foundries. Pop. (1900) 6,003.

Hamasah, or HAMĀSEH, a collection of Arabian poems illustrative of fortitude, and compiled by Abu Temnam, i.e. Habib ibn Aus et-Tai (807-832). It contains about 880 poems taken from the works of the minor Arabian poets, ranging from pre-Islamic times down to the 8th century. See Lyall's *Ancient Arabic Poetry* (1885); Rückert's German trans. (1846); and G. W. Freytag's monumental edition of the Arab text with a Latin trans. (1828-51).

Hamath, or HAMAH (anc. *Epiphania*), mentioned in Num. 13:21, etc., a Syrian city on the Orontes, between Damascus and Aleppo. It was one of the chief towns of the Hittites, and was finally conquered by the Assyrians in the 8th century B.C. The deity of Hamath was called Ashima (2 Kings 17:30) or Eshmun, and was one of the chief Hittite deities. It has always been an important place on the trade route from Assyria to Egypt. There are manufactures of silk, cotton and woollen goods, and gold and silver thread. Pop. 40,000.

Hambach, vil. in the Bavarian palatinate, Germany, 2 m. S. of Neustadt-on-the-Hardt, the scene in 1832 of a popular demonstration (Hambacher Fest) which proclaimed 'the sovereignty of the people' as the foundation of organized government. Pop. (1900) 2,244.

Hambato, or AMBATO, cap. of Tunguragua, Ecuador, between Cotopaxi and Chimborazo, 90 m. S.E. of Quito; trades in sugar, grain, and cochineal. It has been twice destroyed by eruptions of Cotopaxi. Pop. 12,000.

Hamburg, sept. tn., Germany, chief tn. of the independent state of Hamburg, and the most important seaport on the continent of Europe, on the r. bk. of the Elbe, 75 m. above its outflow into the North Sea, and 178 m. by rail n.w. of Berlin. During the second half of the 19th century its foreign trade increased to an extraordinary extent—viz. from a total of £26,455,000 (imports, £16,509,000; exports, £9,946,000) in 1851 to a total of £253,380,550 (imports, £140,449,550; and exports, £114,931,000) in 1905; of these amounts, £23,753,700 and £23,410,000 respectively represented the trade with the United Kingdom. Besides this, its rail and river borne trade with the interior of Germany increased from £19,553,000 in 1851 to £157,989,500 in 1903. Ocean-going vessels drawing 234 ft. can ascend at high water to the city. In 1906 Hamburg owned a

the embarkation of emigrants from the middle and east of Europe, the greater number proceeding to the United States: the average for 1871-80 was 43,092; for 1881-90, 90,889; for 1891-1900, 67,819; and for 1901-5, 127,379. The city has large tobacco, chemical, india-rubber, and furniture factories, engineering works, ship-building yards, printing offices, factories for canned foods, clothing, paper, and sugar, breweries and distilleries.

In appearance Hamburg is a very modern town. Among the public buildings and institutions are the churches of St. Michael (1750-62), St. Peter (1842-9), and St. Nicholas (1846-63), the town hall (1886-97), marine office (*Seezwarte*), the museums of fine arts, the arts and crafts (1878), natural history (1891), and botany, the commercial and municipal libraries (the latter of considerable value), the hygienic institute,

middle of that century, the disseminator of Christianity through N. Europe. After frequent pillagings and burnings from Northmen, Danes, and Slavs (Wends, etc.), the city began towards the end of the 12th century to be frequented as a trade centre. Towards the middle of the following century it was united with Lübeck and Bremen (to which the archiepiscopal see was transferred in 1223), and thus became a participator in the Hanseatic League. Another impulse was imparted to its commercial importance in 1619, when the Bank of Hamburg was founded; and about this time there settled in the town English merchant adventurers, and numberless Jews expelled from Spain and Portugal. In 1806 the town was occupied by the French, and during 1813-14 very harshly treated by their general, Davout.

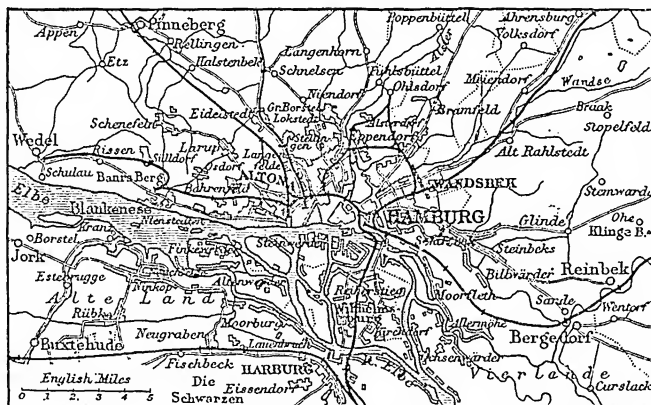
The state of Hamburg has an area of 160 sq. m., and population (1900) of 768,349, of whom over 90 per cent. are Evangelical Protestants. The state has one vote in the Federal Council, and sends three members to the Imperial Diet. The legislative power is vested in a Senate (18 members) and a House of Burgesses (160); the executive power almost entirely in the former.

Hamburg-American Steamship Line, which owns the largest fleet of steamships in the world, was established in 1847 with a small fleet of cargo boats trading between Hamburg and New York. It now possesses 149 steamers, which aggregate 725,399 tons. The principal steamer is the *Deutschland*, of 234 knots speed. There are two other very large steamers, one 22,500, the other 25,000 tons. Besides the express service between Hamburg, Dover, Cherbourg, and New York, there are services from Hamburg to the chief ports of Canada, United States, West Indies, South and Central America, the Mediterranean, and the East.

Hamburg-South American Steamship Line, established at Hamburg in 1871, conducts a passenger service from Hamburg and Southampton to South America. It possesses a fleet of 34 steamers, aggregating 157,000 tons.

Hamburger Nachrichten, *Die (The Hamburg News)*, was founded in 1792. It publishes two editions a day, and is a paper of moderate Liberal views. It was frequently used by Prince Bismarck for semi-official communications.

Hameln, tn. in the Prussian prov. of Hanover, on the Weser, 33 m. by rail s.w. of Hanover, with many mediæval houses. It is famous for the legend of the Pied Piper, versified by Browning,

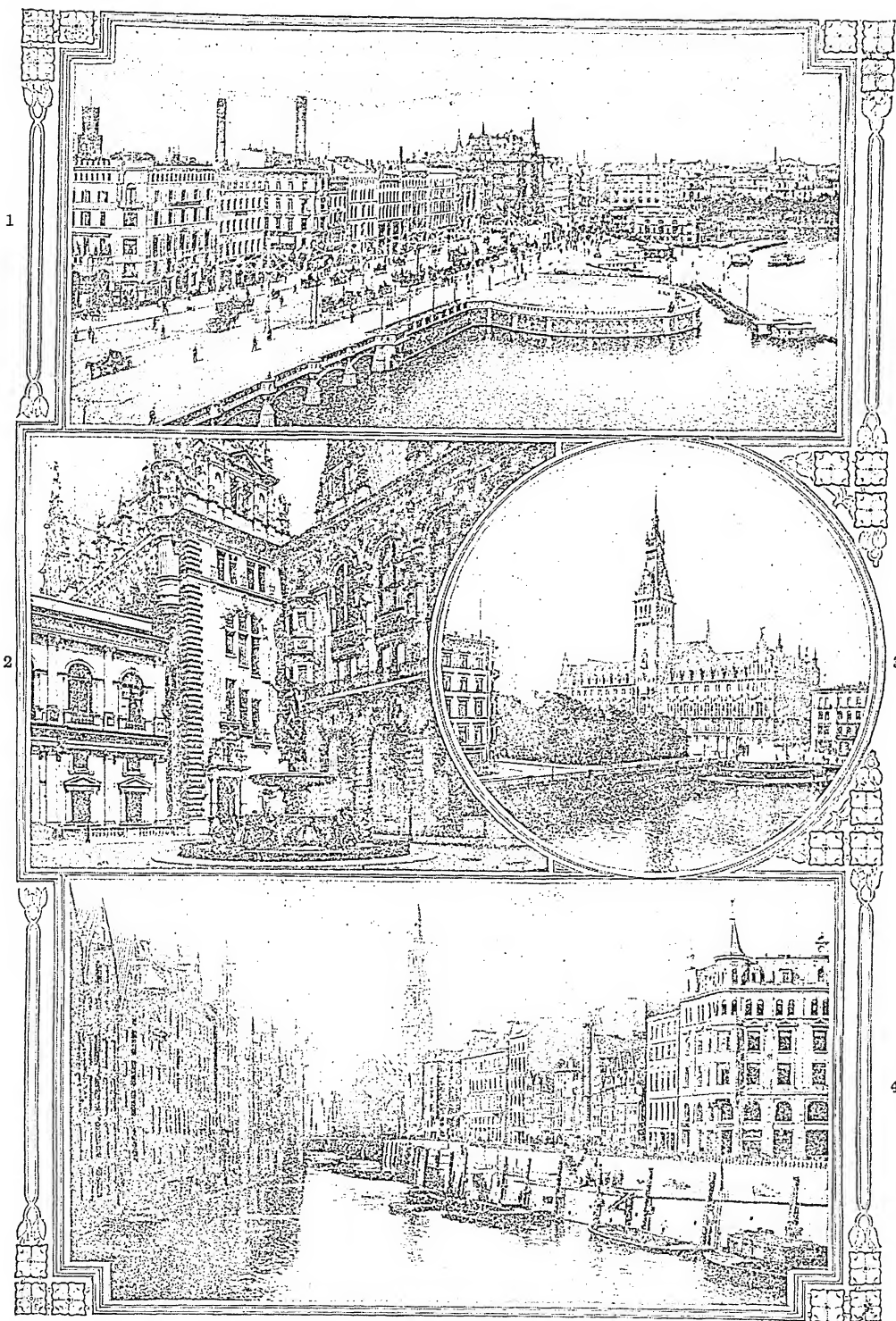


Hamburg and its Environs.

mercantile fleet of 1,077 sea-going vessels, aggregating 1,362,148 tons, of which 634 vessels of 1,082,859 tons were steamships—among the latter the fleet of the Hamburg-American line, including some of the largest passenger steamships on the ocean. In 1871 the port owned 448 sea-going vessels of 214,280 tons, of which only 94 of 78,000 tons were steamships. The docks (twelve tidal basins) and wharves line both banks of the Elbe (i.e. the island of Wilhelmsburg on the south). The greater part of the harbour constitutes a free port, which was constructed in 1883-8 at a cost approximately of £7,000,000, and includes an area of 2,570 acres, of which some 1,750 acres are land surface. Two large new docks were completed in 1904, and the total water area of the docks now amounts to 1,260 acres. Hamburg is one of the principal ports on the Continent for

and a fine hospital (at Eppendorf). A new observatory was planned in 1901, a state institution for the study of earthquakes was founded in 1903 in connection with the Physical Laboratory, and a new central railway terminus will be completed early in 1907. One of the most prominent features of the town is a lake-like expansion of the Alster, a little stream which joins the Elbe. Pop. (1811) 106,983; (1875) 374,930; (1900) 705,738; (1905) 872,028—thus the second largest city of the German empire. Hamburg occupies a distinguished place in the history of German literature and the drama, having been the home of Lessing, Heine, Klopstock, Hagedorn, Reimarus, Voss, Claudius, and Schröder.

Hamburg seems to have been originally founded early in the 9th century, and under Archbishop Ansgar became, about the



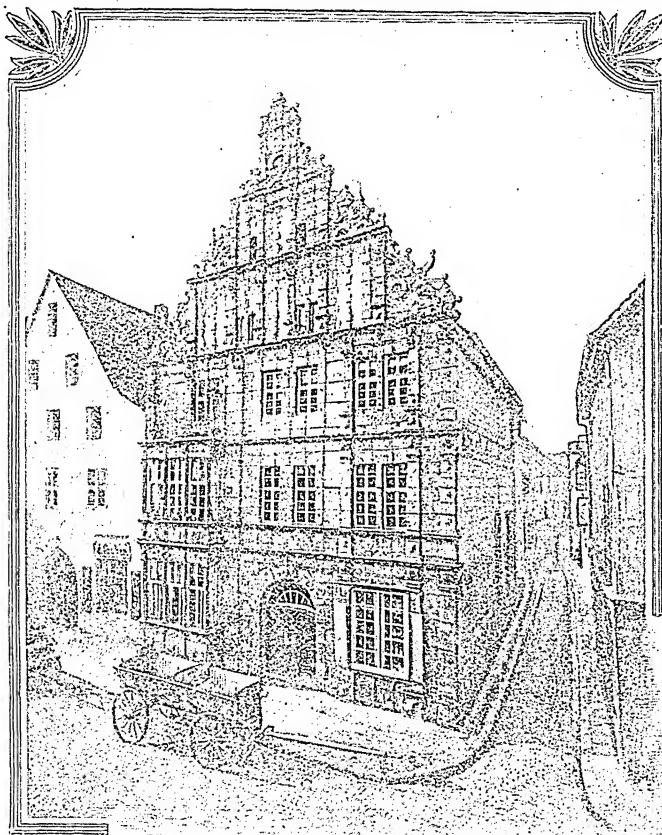
Views in Hamburg.

1. Jungfernstieg and Alster pavilion. 2. Rathaus, Ehrenhof. 3. Rathaus and Alster. 4. St. Catherine's Church and the Dovenfluth.
(1, 2, and 3. Photos by Photochrom Co.)

and said to be founded on an authentic incident of June 26 1284. Pop. (1900) 18,935.

Hamerling, ROBERT (1830-89), Austrian poet, born at Kirchberg in Lower Austria; taught in the grammar school at Trieste from 1855 to 1866, and lay on a sick-bed at Graz from the latter year till his death. His principal works are philosophical epic poems—*Ahasver in Rom* (1866), *Der König von Sion* (1869), and *Homunculus* (1888)—and lyrical

on art, was born at Laneside, near Oldham, and lived near Autun, in France, and then at Boulogne-sur-Seine, where he died. He was editor of the *Portfolio* from 1869; and among his numerous books, *The Intellectual Life* (1873), *Round my House* (1876), *Modern Frenchmen* (1878), *Etching and Etchers* (1868), *The Graphic Arts* (1882), *Landscape* (1885), *Contemporary French Painters* (1865), and its sequel *Painting in France after the Decline of Classicism*



The Ratecatcher's House, Hameln.

poems, such as *Das Schwannenglied der Romantik* (1862), *Amor und Psyche* (1882; beautifully illustrated by Thumann), *Blätter im Winde* (1887). The principal characteristics of his writing are energy of versification, glow of colour, attention to form, and a strong satiric attitude—this in the philosophical sense; also a tendency to pessimistic gloom. See his *Sämmtliche Werke* (1889), and *Life* by Polzer (1889).

Hamerton, PHILIP GILBERT (1834-94), English writer, chiefly

(1869) are the most outstanding. His *Autobiography* and *Memoir*, by his widow, were published in 1897.

Hamesucken, in Scots law, the crime of maliciously assaulting a person in his own house, the assailant having entered the house with a view to commit the assault. Till 1887 hamesucken was a capital offence.

Hami (in Russian. *Khami*, or *Khamil*), tn. of S. W. Mongolia, in 42° 53' 20" N. and 93° 65' E. Pop. about 6,000.

Hamilcar, several generals of ancient Carthage; in particular, **HAMILCAR BARCA**, the father of Hannibal, to whose family the designation 'Barcine' was afterwards attached. He took command of the Carthaginian forces in Sicily during the first Punic war in 247 B.C., and maintained his position near Panormus (Palermo) in spite of all the endeavours of the Romans to expel him. But the Roman naval victory at the Ægadian Islands in 241 B.C. brought the war to an end. After suppressing a revolt of the Carthaginian mercenaries (240 to 238 B.C.), he set about the conquest of Spain, to compensate for the loss of Sicily and Sardinia, and in nine years secured a great part of the country. He fell in battle (228 B.C.).

Hamilton, in geology, an epoch of Devonian time, forming the middle division of that system as recognized by American geologists. Its deposits are sandstones, shales, and limestones, and in New York and Pennsylvania they attain a thickness of 1,500 ft. Lime and hydraulic cement are obtained from this group, and in New York the Hamilton flagstones are largely used for paving and for building. In Canada part of the thick Devonian series belongs to this period, and it is also represented in the Mackenzie R. and in the Pacific states. The limestones are often crinoidal and are full of brachiopods, especially *Rhynchonella cuboides*. Many fragments of ferns and Fquisetaceæ (*Calamites*) are found in the shales and sandstones. Corals are abundantly represented in some beds (*Heliothyllum*, *Cystiphyllum*, *Zaphrentis*, *Michelinia*), and molluscs, crustaceans, and fishes also occur. Some of the insects measured five inches from tip to tip of the extended wings. They seem to be related to the existing Ephemera and Orthoptera.

Hamilton. (1.) Market town, pol. and parl. bor., Mid-Lanarkshire, Scotland, near the junction of the Avon and the Clyde, 10½ m. S.E. of Glasgow. It is the centre of a very rich coal and iron field. Hamilton Palace, the seat of the dukes of Hamilton, stands near the town. Wild white cattle are still preserved in the park, which is part of Cadzow Forest. The dépôt of the Lowland Infantry Brigade is located here. Iron and brass foundries, cotton mills, etc. Pop. (1901) 32,775. (2.) Town, Ontario, Dominion of Canada, at the W. end of Lake Ontario, 56 m. N.W. of Niagara Falls. It lies in the 'garden of Ontario,' and is the seat of an Anglican and of a Roman Catholic bishop. Iron works, cotton and tobacco factories. Pop. (1901) 52,634. (3.)

City, Ohio, U.S.A., co. seat of Butler co., on the Great Miami R., 25 m. N. of Cincinnati. It has manufactures of beer, paper, flour, woollen goods, machinery, and agricultural implements. Pop. (1900) 23,914. (4.) Capital, cos. of Dundas and Normanby, 198 m. W. of Melbourne, Victoria, Commonwealth of Australia. It has a racecourse, being the sporting centre of the western district; also a butter factory and freezing and meat-preserving works. Pop. (1901) 4,026. (5.) Chief town of the Bermudas, W. Indies, on Hamilton I. Pop. (1901) 2,246.

Hamilton, PORT (Kor. *Kōmun do*), group of islands off S. coast of Korea; occupied by Great Britain in 1885-7.

Hamilton, a noble Scottish family, the earliest known to Scottish history being Walter de Hamilton, or Walter Fitzgilbert, who obtained from Robert the Bruce the barony of Cadzow, in Lanarkshire. From Walter's second son are descended the Hamiltons, earls of Haddington, of whom the most notable was Thomas, Earl of Melrose, and first Earl of Haddington (1563-1637), a distinguished lawyer during the reign of James VI., and lord president of the Court of Session (1592). The founder of the exceptional fortunes of the senior branch was Sir James, first Baron Hamilton (d. 1479), son of Sir James, fifth baron of Cadzow, created a lord of Parliament in 1445 under the title of Lord Hamilton of Cadzow. Through his marriage to Lady Euphemia, widow of Archibald, fifth Earl of Douglas, the second lord became closely related to the Douglasses, and was for a time one of their most powerful confederates; but his second marriage to the Princess Mary, daughter of James II. (1469), widow of Thomas Boyd, Earl of Arran, ultimately enabled the Hamiltons to outlive the Douglasses in political consequence. Among the natural children of the second Lord Hamilton was the famous knight, Sir Patrick Hamilton of Kincavel, father of Patrick Hamilton the martyr (?1504-28). Lord Hamilton's son by the Princess Mary, James, second Lord Hamilton (?1477-1529), was also one of the most accomplished knights of his time, and in 1503 was created Earl of Arran. In 1504 he helped to reduce the Western Isles. His command of an important naval expedition in 1513, intended for the aid of the king of France, ended in a fiasco. Among the natural sons of Arran were Sir James Hamilton of Finnart (d. 1540), royal architect, and reconstructor of the palaces of Falkland and Lin-

lithgow; and Archbishop John Hamilton of St. Andrews (?1511-71), under whose presidency an ecclesiastical council issued Hamilton's *Catechism* in 1552, and who was executed for his connection with the assassination of the Regent Moray. On the death of James V., in 1542, James, 2nd Earl of Arran, was chosen governor of Scotland during the minority of Mary. After betraying on various important occasions the interests of Henry VIII., of the Roman Catholics, and of his own family, he was finally persuaded, in 1554, to give way to the queen-regent. Previous to this, his assent to the removal, in 1548, of the young Queen Mary to France had been obtained by a gift to him of the duchy of Châtellerault. In 1559, after much hesitation, he joined the Lords of the Congregation. On the death of Queen Mary's husband, Francis II. of France, he endeavoured unsuccessfully to arrange a marriage between her and his son, the Earl of Arran. His opposition to the Darnley marriage was inevitable; but he obtained pardon for his armed resistance, on consenting to five years' banishment (1566). On the death of Darnley the attitude of the Hamiltons towards Mary was necessarily changed. To further their own ends, they aided in her escape from Lochleven; and after Mary's defeat, the duke, having in 1569 returned to Scotland, was arrested by the Regent Moray. Receiving his liberty after the regent's assassination, he supported the queen's party during the subsequent civil war; but in February 1573 he made terms with Morton. He died Jan. 22, 1575.

His eldest son, James, third Earl of Arran (1530-1609), as presumptive heir to the Scottish crown, occupied for some time a prominent position in political intrigue. Henry VIII., in 1543, made a proposal for the marriage of Arran with the Princess Elizabeth, but it came to nothing. At a later date he became a formal suitor for the hand of Queen Mary. His third brother, Claud, Lord Paisley (?1543-1622), a man of more restless energy, became one of the most trusted agents of Queen Mary and the Roman Catholics, and was concerned with Huntly in a scheme for a Spanish invasion. About 1590 he, however, lost his reason. The third Earl of Arran was succeeded in 1609 by James, second Marquis of Hamilton (1589-1625). Like his father, he was a trusted adviser of James VI. His son James, third Marquis and first Duke of Hamilton (1606-49), became a confidential adviser of Charles I. in his Scottish policy;

but by his temporizing aims he lost the confidence of the more devoted loyalists. Nevertheless, he was chosen to lead the Scottish army sent into England in 1648 for the rescue of the king; and having, after its ignominious defeat at Preston, surrendered himself a prisoner, he was executed March 9, 1649. He was succeeded as second duke by his brother William (1616-51), who in 1639 had been created Earl of Lanark. Having accompanied Charles II. on his march to England, he was mortally wounded at Worcester, and died Sept. 12, 1651.

On the death of the second duke the estates devolved on Lady Anne, Duchess of Hamilton (1636-1716), daughter of James, first duke, and wife of Lord William Douglas (1635-94), created in 1646 Earl of Selkirk. At the restoration the Earl of Selkirk was (Oct. 12, 1660) created Duke of Hamilton for life. A strong opponent of the persecuting policy of Lauderdale, he in 1689 presided at the convention which tendered the crown of Scotland to William and Mary. James (1658-1712), the fourth duke, opposed the grant of the Scottish crown to William of Orange. In the Scottish Parliament he became the leader of the country party, and was a strenuous opponent of the union. He was killed in a duel with Lord Mohun in Hyde Park, London, on Nov. 13, 1712.

James George, seventh Duke of Hamilton and fourth Duke of Brandon (1755-69), became in 1761 the male representative of the ancient house of Douglas, and succeeded to the titles Marquis of Douglas, Earl of Angus, etc. The title of Duke of Châtellerault is claimed by the dukes of Hamilton and also by the Duke of Abercorn, descended from Lord Claud Hamilton, afterwards Lord Paisley. James (d. 1617), eldest son of Lord Paisley, was in 1603 created Baron of Abercorn, in 1606 advanced to the dignity of earl, and in 1616 created a peer of Ireland by the title of Baron of Strabane. James, eighth earl (1712-89), was in 1786 created a peer of Great Britain by the title Viscount Hamilton. In 1790 John James, ninth earl, was advanced to the dignity of Marquis; and in 1868 James, second marquis, who on Jan. 13, 1862, was served heir male of the first Duke of Châtellerault, was created Duke of Abercorn and Marquis of Hamilton. See 'Hamilton Papers' in *Maitland Club Miscellany*, vol. iv.; Anderson's *Genealogical History of the Hamiltons* (1825); Burnet's *Lives of the Hamiltons* (1677).

Hamilton, ALEXANDER (1757-1804), American statesman, born on the island of Nevis, West Indies. When the trouble with England developed, he delivered a stirring speech in New York, and attracted attention to himself by a couple of political pamphlets. Though only eighteen, he was given an artillery command, and was present at the battles of White Plains, Trenton, Princeton, and at the capture of the British army at Yorktown. Eventually he became second in command to Washington. After taking part in the various conventions which led up to the framing of the United States constitution, he became secretary of the treasury (1789-95). In that position he was instrumental in founding the National Bank and framing the protective tariff. He was also an anti-slavery advocate. He died from a wound received in a duel with his political opponent Burr. See his *Works*, ed. H. C. Lodge (9 vols. 1885-6); his *Letters*, ed. G. Atherton (1903); and *Lives* by J. C. Hamilton (1834-40), Morse (1876), Lodge (American Statesmen Series, 1882), and Sumner (1890); also F. S. Oliver's *Alex. Hamilton* (1906).

Hamilton, ANTHONY, COUNT (?1646-1720), a scion of the house of Abercorn, appeared as a captain of the French army in Limerick (1673), of which place he became governor (1685), and commanded the dragoons at the siege of Enniskillen. After the battle of the Boyne (1690) he retired to the exiled court of St. Germain-en-Laye, where he died. His ease and grace of style and thought are seen in his letters, verses, and *contes*. For his share in the *Mémoires de la Vie du Comte de Grammont*, see GRAMONT, PHILIBERT DE. See biographical notices prefixed to his *Collected Works* (1825).

Hamilton, SIR BRUCE MEADE (1857), British soldier, has seen service in the Afghan war (1878-80), the Boer war (1881), the Burmese war (1885), Ashanti (1895), and Benin expedition (1897). He commanded a mobile column of all arms in the S. African war, and greatly distinguished himself in the fighting outside Johannesburg. He was given (1904) command of the 2nd division of the Aldershot Army Corps.

Hamilton, SIR EDWARD (1772-1851), British admiral, who, in command of the *Surprise*, conducted (1799) the cutting out of the *Hermione* from under the batteries of Puerto Cabello, Venezuela, one of the most brilliant exploits of the British navy. He became a full admiral in 1846.

Hamilton, ELIZABETH (1758-1816), Scottish authoress, born at Belfast in Ireland; was brought

up on a Stirlingshire farm, and in her later years lived in Edinburgh and Harrogate. She is remembered for the special charm which, first, revealed in her song, *My Ain Fireside*, is seen at its best in her Scottish domestic story, *The Cottagers of Glenburnie* (1808). For wit, humour, and absolute truth to life it rivals some of Galt's best work. See *Memoirs* by Miss Benger (1818).

Hamilton, EMMA, LADY, née AMY LYON (?1761-1815), a native of Cheshire, lived in London (1782-6) under the protection of the Hon. Charles Greville, and in Naples under that of his uncle, Sir William Hamilton, whom she married (1791). Her extraordinary beauty (immortalized in many portraits by Romney), her social charm, and her friendship with the queen of Naples, made her the leading figure in that city, and gave her great political influence, which she used with equal loyalty to Naples and to Britain. Her story is one with that of Lord Nelson, her lover. See the article on his life and the works cited there, also J. C. Jeaffreson's *Lady Hamilton and Lord Nelson* (1887), and *The Queen of Naples and Lord Nelson* (1889); 'Nelson's Last Codicil,' in Colburn's *United Service Magazine* (April and May 1889); Paget's *Paradoxes and Puzzles* (1874), supplemented by *Blackwood's Magazine* (May 1888); Sichel's *Emma, Lady Hamilton* (1905), and *Nelson's Letters to Lady Hamilton* (1905).

Hamilton, LORD GEORGE FRANCIS (1845), British statesman, third son of the first Duke of Abercorn, began his official life at the India Office in 1874, when he was appointed under-secretary by Disraeli, and filled the position for four years. During the last two years of the Disraeli administration (1878-80) he was vice-president of council of education. The Marquis of Salisbury, during his 'stop-gap' government (1885-6), made him First Lord of the Admiralty, and re-appointed him to that office in his second administration (1886-92). In 1895 Lord George Hamilton was transferred to the India Office, this time as Secretary of State, and he was confirmed in this appointment in 1900, and again in July 1902 when Mr. Arthur Balfour became prime minister. He retired from the government in 1903, owing to differences with Mr. Balfour on the fiscal question. Lord George Hamilton entered Parliament in 1868 as member for Middlesex, and from 1885 to 1906 sat for the Ealing division of the same county. He was chairman of the London School Board (1894-5).

Hamilton, SIR IAN STANDISH MONTEITH (1853), British general,

born in the island of Corfu; saw service in Afghanistan (1878-80), in South Africa (1881), when he was wounded at Majuba Hill, and with the Nile expedition (1884-5), and was present at Kirbekan. He next served with the Burmese expedition (1886-7), and with Sir R. Low's Chitral relief force (1895). He commanded the third brigade in the Tirah expeditionary force (1897-8) under Sir W. Lockhart. On the outbreak of the Boer war, Hamilton was appointed chief of the staff of the Natal Field Force, then under Sir George White; and subsequently to the command of a brigade of infantry. He commanded at Elands-laagte (Oct. 21, 1899), where he displayed conspicuous gallantry. In the defence of Ladysmith he was in command of the position of Caesar's Camp and Waggon Hill, and had to bear the brunt of the fierce Boer attack on Jan. 6, 1900. He joined Lord Roberts at Bloemfontein after the relief of Ladysmith, and was given the command of the mounted infantry division. On Nov. 9, 1901, he took up the duties of chief of the staff in South Africa, and commanded the mobile columns in the W. Transvaal. In April 1903 he became quartermaster-general of the army, but vacated the appointment early in 1904 on the reorganization of the War Office. He then proceeded to Manchuria to represent the Indian army with the Japanese forces in the field, and returned in April 1905 to take up command of the Southern Command. He has published *Icarus* (1886), *A Jaunt in a Junk* (1884), *Fighting of the Future* (1885), *A Ballad of Hadji* (1887), and *A Staff-Officer's Scrap-Book during the Russo-Japanese War* (1905).

Hamilton, JAMES (1769-1829), English educationist, was born in London; repaired to New York (1815), where he began to teach languages on a method of word-for-word translation before the study of grammar, adopted from General D'Angeli, a French *émigré*. His system met with much ridicule in the States, but after a favourable report by experts he soon had many pupils. From 1823 he taught in Britain. See his *Principles, Practices, and Results of the Hamiltonian System* (1829).

Hamilton, JOHN M'LURE (1853), portrait-painter, born of English parents in Philadelphia, U.S.A., and settled in London in 1878. He began as a painter of subject pictures, such as *The Syren*, *The Heiress*, and *Cerise*; but he turned to portraiture. His two famous portraits of Gladstone are in the Luxembourg at Paris and the Pennsylvania Academy

of Fine Arts at Philadelphia. Other notable portraits are of *Mrs. Gladstone, Bismarck, Cardinal Manning, Professor Tyn-dall, Herbert Spencer, G. F. Watts.*

HAMILTON, PATRICK (?1504-28), Scottish reformer, born at Kin-cavel, Linlithgowshire. Having gone abroad to avoid Beaton, he matriculated at the university of Marburg, where he wrote in Latin his only book, *Loci Communes*, popularly called 'Patrick's Pleas,' propositions stating the doctrines whereon the reformation was based (1527). After teaching for some time in St. Andrews, he was arrested on a charge of heresy, and was burned. See *Life by Lorimer* (1837).

HAMILTON, WILLIAM (?1665-1751), of Gilbertfield, Scottish poet, was born at Ladyland, Ayrshire. His poem, *Last Dying Words of Bonnie Heck*, on the model of Sempill's *Habbie Simson*, appeared in Watson's *Choice Collection* (1706). In 1719 he conducted in this same stave a sprightly correspondence with Allan Ramsay, which is usually included in Ramsay's *Works*. He is also generally regarded as the author of 'Willie was a Wanton Wag,' in Ramsay's *Tea-table Miscellany*. But his best-known work was his modernized version of Blind Harry's *Wallace* (1722). Burns adopted the Sempill-Hamilton stave in his poetic epistles.

HAMILTON, WILLIAM (1704-54), Scottish poet, was born at Bangour, Linlithgowshire. Joining the Jacobites during the '45, he escaped after Culloden to the Continent, but was afterwards allowed to return to Scotland. He was the author of *Poems on Several Occasions* (best edition, with memoir, 1760). He is remembered chiefly for his *Braes of Yarrow*. See James Paterson's *The Poems and Songs of William Hamilton* (1850).

HAMILTON, SIR WILLIAM (1730-1803), British ambassador and antiquarian, grandson of the third duke, was British ambassador at Naples (1764-1800). He acquired a valuable collection of vases, terra-cottas, bronzes, etc. But he is chiefly remembered as the husband of Emma, Lady Hamilton, the mistress of Lord Nelson. He was the author of *Antiquités Etrusques* (4 vols. 1763-7), *Observations on Mount Vesuvius* (1772), and *Campi Phlegreæ* (1776-7).

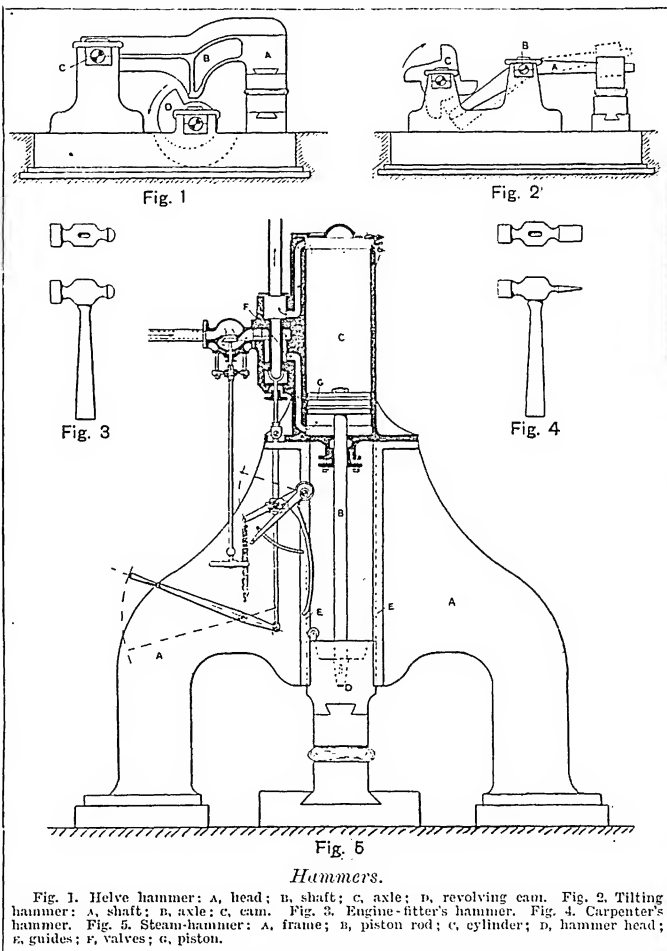
HAMILTON, SIR WILLIAM (1788-1836), Scottish philosopher, was born at Glasgow. In 1829 and the following years he contributed to the *Edinburgh Review* several philosophical articles, which made his reputation as an able and learned thinker. In 1836 he was appointed professor of logic and metaphysics in Edinburgh University. A volume of *Discus-*

sions (containing his articles in the *Edinburgh Review*, 1832), and his edition of Reid's *Works* (1846; newer ed. 1862), were published during his lifetime, his *Lectures on Logic and Metaphysics* (4 vols. 1859-61) after his death. While professing himself an adherent of the Scottish philosophy, Hamilton departed in many ways from Reid. His most characteristic and well-known contribution, the 'doc-

trine of the conditioned,' shows the influence of Kant. According to this doctrine, to think any object is *co ipso* to condition it, because in being thought it is necessarily related both to the thinker and to other objects. All knowledge, therefore, is knowledge of the conditioned only. This doctrine, and its theological development by Mansel, led to an animated controversy. The best known criticism of Hamilton's

philosophy as a whole is that by J. Stuart Mill in his *Examination of Sir William Hamilton's Philosophy* (1865). On Hamilton's logical doctrine of the 'quantification of the predicate,' see Keynes's *Formal Logic* (1884), part ii. ch. vi. See the volume *Hamilton in Philosophical Classics* by Veitch (1869).

HAMILTON, WILLIAM GERARD (1729-96), Anglo-Irish politician, entered the English Parliament



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(1754) for Petersfield in Hampshire, and so greatly distinguished himself by a speech on the Address (1755) that, although he often spoke afterwards, he became known as 'single-speech Hamilton.' He was a prominent member also of the Irish Parliament. With Burke, his private secretary, he quarrelled; but with Johnson he remained on intimate terms. His *Parliamentary Logick*, a collection of his works, was

published (1808) after his death. See Malone's preface to *Parliamentary Logick* (1808); Sir J. Prior's *Life of Burke* (1854).

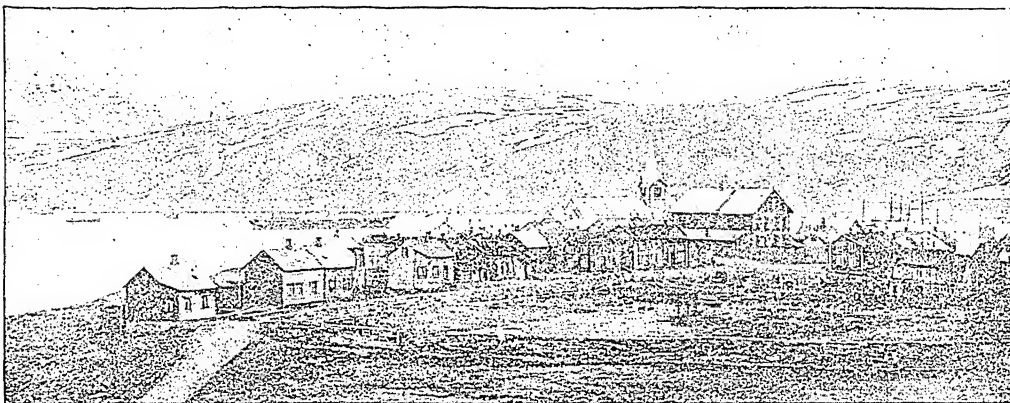
Hamilton, Sir WILLIAM ROWAN (1805-65), Irish mathematician, inventor of the science of quaternions. Born in Dublin, he early attracted the attention of Sir John Herschel and Professor Airy. In optics he proved that certain rays of light emerge from a crystal, not as single or double rays, but as conical pencils; this led to a convincing proof of the 'undulatory theory of light.' After being, in 1827, while yet an undergraduate, appointed Andrews professor of astronomy in his university, Hamilton became astronomer-royal for Ireland. Hamilton's chief claim to distinction is the invention of an entirely new method of dealing mathematically with the science of space—'a method,' says Professor Tait,

author, born at Bodmin; served through the Crimean war, and with marked distinction at Inkerman. His lectures as a professor at Sandhurst were expanded into *The Operations of War* (1866). Hamley was commandant of the Staff College (1870-77), and became commander of a division in Egypt (1882). Thinking that his services at Tell-el-Kebir had been overlooked, he published a special report. At home he was regarded as an ill-used man, but received no further official employment. As M.P. for Birkenhead (1885-92) he was a consistent critic of the War Office. In addition to his *Operations*, Hamley wrote a brilliant short history of the Crimean war (1891), and edited the first series of *Tales from Blackwood*. See Innes Shand's *Life of Hamley* (2 vols. 1895).

Hamlin, HANNIBAL (1809-91), American statesman, born at

trade in oil, lace, ribbons, linen, and flax. Pop. (1900) 13,611.

Hammer, a tool with a heavy, blunt head of steel, used for striking blows. Hand hammers have a wooden handle or shaft, usually of ash or hickory, and proportioned to the weight of the head. Helve hammers, used for working puddled iron, consist of a steel-faced head on an iron shaft about ten feet long, the whole weighing several tons. The light end of the shaft is attached to an axle, on which it is free to turn. A projection on the head is caught by a revolving cam, lifted up for a height of about a foot once every second, or oftener, and allowed to drop with the full weight of the head upon the object to be struck. A tilting hammer is worked on a somewhat similar principle, but is lighter, and strikes several hundred blows a minute. Both these are usually worked by steam. What,



Hammerfest, the most northerly Port in the World.

(Photo by J. White & Son.)

'which can only be compared with the *Principia* of Newton and the *Mécanique Céleste* of Laplace as a triumph of analytical and geometrical power.' This new system of algebra and geometry, called quaternions by Hamilton, expresses relations of space in regard to direction as well as to quantity, and is based on the application of a new interpretation of what were previously called 'impossible quantities.' See *Life* by Rev. R. P. Graves (3 vols. 1883-9).

Hamlet, Shakespeare's tragedy, founded upon a legend in the Latin history of Denmark by Saxo-Græmmaticus (12th century). It is discussed in Latham's *Dissertations on Hamlet* (1872), Simrock's *Quellen des Shakespeare* (1870), and G. P. Hansen's *Legend of Hamlet* (1887).

Hamley, Sir EDWARD BRUCE (1824-93), British general and

author, born at Bodmin; served through the Crimean war, and with marked distinction at Inkerman. His lectures as a professor at Sandhurst were expanded into *The Operations of War* (1866). Hamley was commandant of the Staff College (1870-77), and became commander of a division in Egypt (1882). Thinking that his services at Tell-el-Kebir had been overlooked, he published a special report. At home he was regarded as an ill-used man, but received no further official employment. As M.P. for Birkenhead (1885-92) he was a consistent critic of the War Office. In addition to his *Operations*, Hamley wrote a brilliant short history of the Crimean war (1891), and edited the first series of *Tales from Blackwood*. See Innes Shand's *Life of Hamley* (2 vols. 1895).

Hamm, tn., prov. Westphalia, Prussia, 19 m. by rail E.N.E. of Dortmund, with iron industries, tanneries, engineering works, breweries, saw and flour mills. Pop. (1900) 31,371.

Hammamet, seapt. tn., on N. shore of gulf of same name, 36 m. S.E. of Tunis, N. Africa. Pop. 5,000.

Hamme, tn., prov. E. Flanders, Belgium, 18 m. N.E. of Ghent;

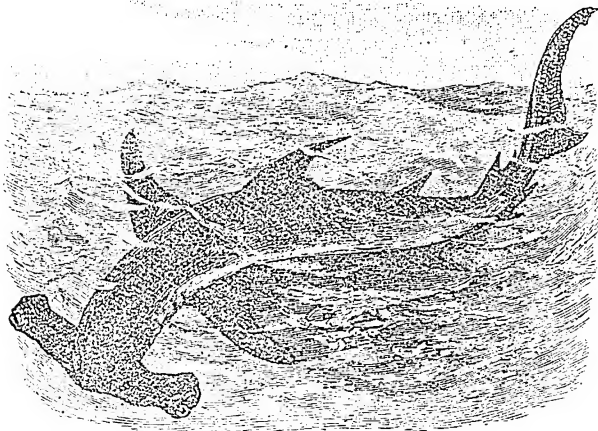
however, is generally known as the 'steam-hammer' consists of a massive iron frame, in which the piston rod of an inverted vertical cylinder lifts the hammer head between guides, and allows it to drop, under control, with enormous impact. By an automatic arrangement of valves steam is admitted into the cylinder below the piston immediately the object is struck, so that the head is at once raised for another blow. In a double-acting hammer steam is admitted above the piston on the down-stroke, thus greatly increasing the force of the blow. Conversely, by 'cushioning' the piston with the admission of steam below it just before the moment of impact, a blow of any degree of gentleness may be obtained. This hammer was invented by James Nasmyth about 1839-42, and first used at Patricroft, near Manchester, England.

Hammerfest, seapt. tn., Finmark, Norway, the most northerly port in the world, on the island of Kvalø, with a good harbour, in 70° 39' 15" N. lat. It shares in the Spitzbergen whale fisheries. Cod-liver oil is produced. Since its almost total destruction by fire in 1890 the town has been well built of wood. The 'midnight sun' may here be observed from the 13th May to the 29th July. Pop. (1900) 2,298.

Hammer-headed Shark, or **HAMMER-HEAD**, names given to the species of *Zygæna* of which *Z. malleus* sometimes occurs in British seas. The special peculiarity is that the head is broad, flattened, and expanded on each side into a process, on the flat terminal surface of which the eye is placed. Spiracles are absent. The hammer-heads occur in all

(new ed. 1840; Eng. trans. 1854, etc.); *Geschichte der Chanc der Krim* (1856); *Geschichte der Osmanischen Dichtkunst* (1836-8); *Litteraturgeschichte der Araber* (1850-6). See *Life*, in German, by Schlottmann (1837).

Hammersmith, metropol. bor. (constituted 1899), Middlesex, England, on the Thames, 5 m. W. of St. Paul's; formerly a suburban village with extensive market gardens. Its old suspension bridge was replaced in 1887 by a fine new bridge with three spans. St. Paul's School, opened in 1884, is an imposing edifice. In Dove's Coffee House Thomson composed part of the *Seasons*. Industries include iron and dye works, electric lamp, sugar, and other factories. The borough returns one member to Parliament. Pop. (1901) 112,245.



Hammer-headed Shark.

the warmer seas, and the species mentioned, which may reach a length of fifteen feet, is a formidable and voracious creature.

Hammerich, PETER FREDERIK ADOLF (1809-77), Danish theologian and historian. In 1859 he was appointed professor of theology at the University of Copenhagen, being an ardent Grundtvigian. His principal historical works are *Danmark i Valdemarernes Tid* (1847); *Danmark under Adelsvaelden* (1854-9); *Danmark under de tre Nordiske Rigers Forening* (1849-54). See his autobiographical *Et Levnetsløb* (1882).

Hammer-Purgstall, JOSEPH, BARON VON (1774-1856), Austrian historian and Orientalist, born at Graz; from 1799 to 1806 acted as interpreter at Constantinople. He was in his day considered an authority on Oriental matters. Chief works: *Geschichte der Assasinen* (1818; Eng. trans. 1835); *Geschichte des Osmanischen Reiches*

Hammock, a swinging bed, appears to be of West Indian origin. Suspended sleeping-nets, made of grasses or fibre, were in common use among the Caribs at the time of the discovery of America by Columbus. The hammock used by sailors is generally made of canvas, the ends being attached to a number of cords, called 'clews,' which are brought together and fastened to iron rings. Hammocks used on land are generally made of small cords, or, in the tropics, of grasses.

Hammond, city, Lake co., Indiana, U.S.A., 20 m. by rail S.E. of Chicago. It carries on meat-packing, steel spring and chemical manufactures, flour-milling, etc. Pop. (1900) 12,376.

Hammond, HENRY (1605-60), English theologian, was born at Chertsey, Surrey. He became rector of Penshurst, Kent (1633), and archdeacon of Chichester (1643). At Oxford, then the king's head-

quarters, he published his *Practical Catechism* (1644), and was appointed a royal chaplain. His later years were spent at Clapham, Bedfordshire, and at Westwood, Worcestershire. As an author he is remembered best by the *Paraphrase and Annotations on the New Testament* (1653). See Bishop Fell's *Life*, prefixed to Hammond's *Miscellaneous Theological Works* (Anglo-Catholic Library, 1847-50).

Hammond, JAMES BARTLETT (1839), inventor (1880) of the typewriter which bears his name, is a native of Boston, U.S.A. He served as a newspaper correspondent during the civil war.

Hammurabi. See KHAMMURABI.

Hamond, SIR ANDREW SNAPE (1738-1828), English naval captain, born at Blackheath, Kent. He served at the battle of Quiberon Bay in 1759; distinguished himself during the American war; and in 1780 was appointed lieutenant-governor of Nova Scotia, and resident commodore at Halifax. In 1793 he was appointed to the Navy Board; and in 1794 became controller of the navy, retiring in 1803.

Hamond, SIR GRAHAM EDEN (1779-1862), English admiral, born at London; served in Lord Howe's flagship at the battle of the First of June 1794. In 1801 he joined the expedition to the Baltic, and was present at the battle of Copenhagen. In 1847 he became an admiral, and in 1862 admiral of the fleet.

Hampden, JOHN (1594-1643), English statesman, probably born in London. During the troubled years from 1625 to 1630 he resisted the court both outside and inside Parliament, in which he sat for Wendover. He was much interested in the foundation of colonies in America; indeed, he may be regarded as one of the founders of Connecticut. In 1635 his opposition to the payment of ship money led to his being tried (1637 and 1638) before the Court of Exchequer. Though judgment was given in favour of the crown, the feeling of the country expressed itself strongly on the side of Hampden, and the Long Parliament reversed the ship-money judgment. In January 1642, at the king's instigation, he was attacked in the House of Lords by the attorney-general. When the civil war broke out, Hampden took an active part in raising troops for the Parliament. He relieved Coventry in August 1642, and took part in the subsequent siege of Reading. In a skirmish at Chalgrove Field in Oxfordshire, on June 18, 1643, he was mortally wounded. See Forster's *Lives of British Statesmen*, vol. iii. (1837).

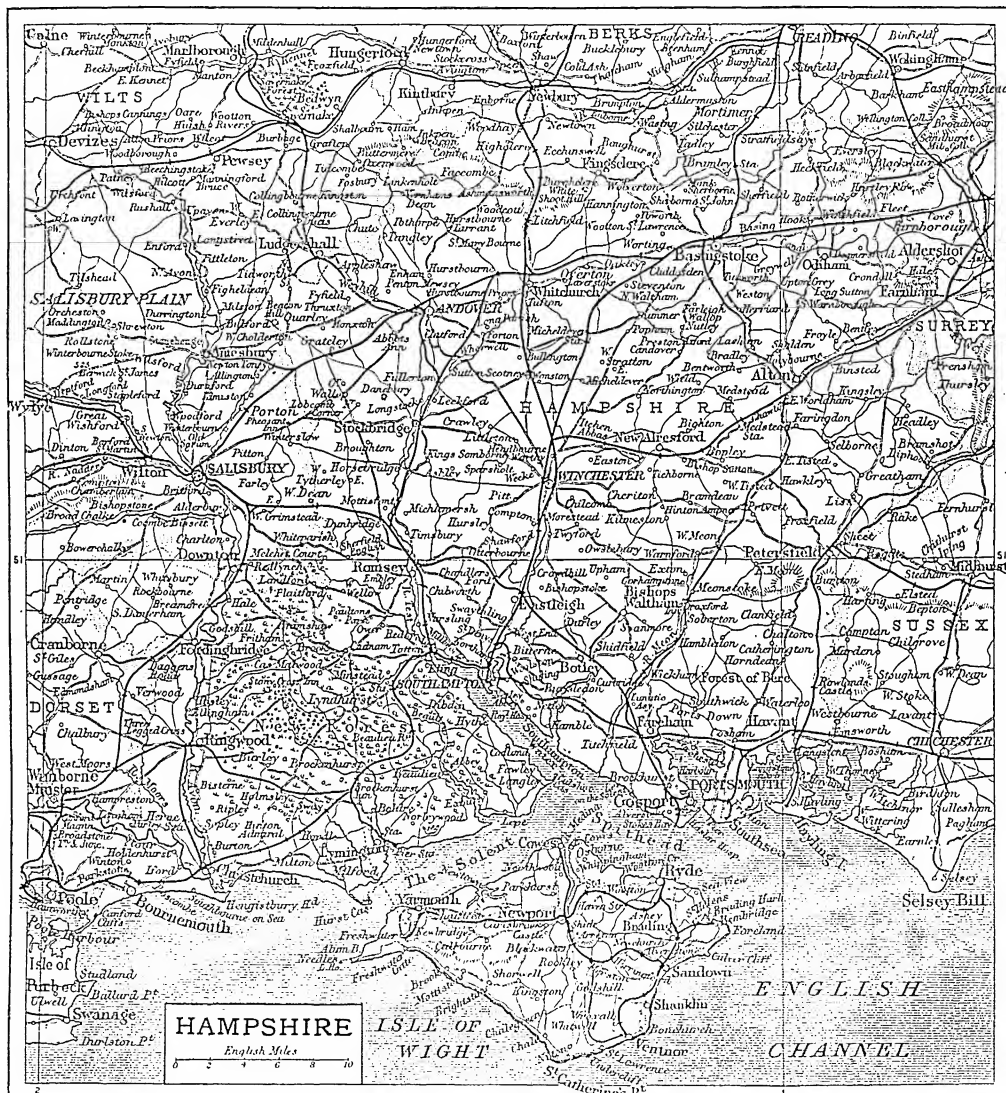
Hampden, RENN DICKSON (1793-1868), born in Barbados; appointed principal of St. Mary's Hall, Oxford (1833), and professor of moral philosophy (1834). After his delivery of the Bampton Lectures for 1832, his nomination to the regius professorship of divinity (1836) was met with a storm

and the Spirit (1847); *Lectures on Moral Philosophy* (1856); *Fathers of Greek Philosophy* (1862). See *Memorials* by his daughter (1871).

Hampole, HERMIT OF. See **ROLLE**, RICHARD.

Hampshire, British first-class armoured cruiser of 10,850 tons, launched at Elswick in 1903.

the Solent separate the Isle of Wight from the mainland. The North Downs stretch through the N.W. and W., rising in Walbury Down to 1,011 ft. In the S.W. is the New Forest (92,365 ac.); in the E. are Bere and Woolmer forests. Agriculture and market-gardening are the principal in-



of criticism. His Bampton Lectures were on *The Scholastic Philosophy considered in its Relation to Christian Theology* (1832), and in these he had exalted the authority of Scripture over that of the church. He was appointed bishop of Hereford in 1847. His other books were *Work of Christ*

Hampshire, HANTS, or COUNTY OF SOUTHAMPTON, a maritime co. in the S. of England. The coast is broken by the deep inlets of Langston and Portsmouth harbours (separated by Portsea I., with Hayling I. on the E.), Southampton Water, and Christ Church and Poole bays. Spithead and

dustries. Manufactures, except those connected with the great government establishments, are few. Roman remains are found. The county, exclusive of the Isle of Wight, returns five members to Parliament. Area (including Isle of Wight), 1,645 sq. m.; pop. (1901) 799,582.

Hampstead, parl. and metropol. bor., and residential suburb, N.W. of London, England, was, during the early part of the 18th century, frequented for its mineral waters. Hampstead Heath (480 ac.), a fine stretch of open ground, is a favourite holiday resort of Londoners. It has literary and artistic associations with Pope, Addison, Gay, Johnson, Byron, Keats, Leigh Hunt, Joanna Baillie, Constable, Du Maurier, and others. It returns one member to the House of Commons. Pop. (1901) met. bor. 81,942; parl. bor. 82,329. See Baines's *Records of Hampstead* (1890), and C. A. White's *Sweet Hampstead* (1901; 2nd ed. 1904).

Hampton, par. and urban dist., Middlesex, England, 15 m. S.W. of London. Hampton Court Palace is situated within the district. Pop. (1901) 6,812.

Hampton, WADE (1818-1902), American soldier, born at Columbia, S. Carolina. Though op-

posed to secession, he joined the Confederate army, and raised a mixed force called 'Hampton's Legion,' which he led with distinction at the first battle of Bull Run. He then took part in the battles of Fair Oaks and Gettysburg. During Sherman's advance from Savannah (1835) he commanded the Confederate rear-guard. Governor of S. Carolina (1877-9) and senator for the state (1879-91), he was appointed in 1893 United States commissioner of railroads.

Hampton Court Palace, on the Thames, 15 m. S.W. of London, erected by Cardinal Wolsey in 1515, was presented by him to Henry VIII. in 1526; and was in great part rebuilt from Wren's designs by William III. It was subsequently occupied by Mary, Elizabeth, Cromwell, the Stuarts, William III., and the first two monarchs of the house of Hanover. In 1604 the Hampton Court Conference, between the Puritans and the Episcopalians, met here under James I. as moderator. Since the time of George II. Hampton Court has

ceased to be a royal residence, and is now occupied by pensioners of the crown. The palace contains a gallery of paintings, rich in Italian works of art. See Law's *Hampton Court in Tudor, Stuart, Orange, and Guelf Times* (1885-91); and *Masterpieces of the Royal Gallery of Hampton Court* (1904).

Hampton Roads, channel and naval station, connecting Chesapeake Bay and James R., Virginia, U.S.A.

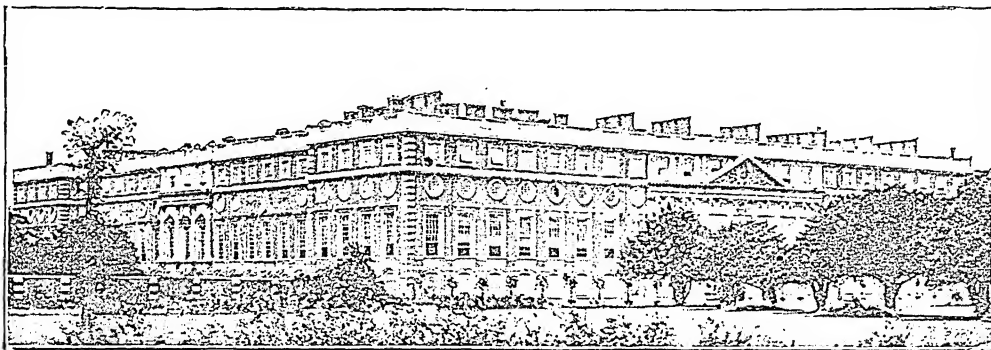
Hampton Roads, BATTLE OF. At the opening of the American civil war, the Confederates converted the wooden 40-gun frigate *Merrimac* into an ironclad, and renamed her the *Virginia* (March 1832). At the same time the North built at New York the turret-ship *Monitor*, from the design of John Ericsson. The rival vessels met on the morning of March 9, 1862, in Hampton Roads. The action began at 8.30 a.m., and, after a long combat, ended in a drawn battle. See Porter's *Naval History of the Civil War* (1887).

Hamster, a name applied to certain Old World rodents, which, together with the American white-footed mice, constitute the large genus *Cricetus*. The common



Hamster.

hamster (*C. frumentarius*) occurs in certain parts of Europe and in Asia, being especially abundant in some districts of Germany. It reaches a length of about one foot, and has a thick, glossy coat, which is highly coloured. Its burrows are of two types—a summer burrow, in which the young are born; and a winter habitation, in which hibernation takes place. Reproduction is rapid; and the hamsters frequently prove a



Hampton Court Palace.

[Photo by City Art Co.]

posed to secession, he joined the Confederate army, and raised a mixed force called 'Hampton's Legion,' which he led with distinction at the first battle of Bull Run. He then took part in the battles of Fair Oaks and Gettysburg. During Sherman's advance from Savannah (1835) he commanded the Confederate rear-guard. Governor of S. Carolina (1877-9) and senator for the state (1879-91), he was appointed in 1893 United States commissioner of railroads.

Hampton Court Conference. On his way to London from Scotland, James I. received a petition called the Millenary Petition, which was presented by the Puritan clergy. Changes in the Prayer-book were proposed which would not have been acceptable to the mass of the clergy, to the universities, or to a large number of laymen. James, who looked upon the Puritans as similar to the Presbyterians, called together a conference at

pest to agriculturists, for they are very destructive to crops, and store a large amount of grain.

Hamsun, KNUT (1860), Norwegian author, born in Gudbrandsdal; ran away to sea when seventeen, and led a roving life abroad (1888). He caused a sensation by the publication (1890) of a fragmentary novel, *Sult* (Eng. trans. *Hunger*, 1899). It is perhaps the most grimly powerful description in literature of slow starvation. None of Hamsun's other works are equal to this, though many of them display great originality and an odd sort of humour which aims at mystification, but too often is unclear—e.g. *Mysterier* (1893); *Redaktør Lynge* (1898). *Norn*, on the other hand (1894), contains wonderful descriptions of forest life and scenery. Still later works are *Siesta* (1897) and *Krattskov* (1904).

Han. (1.) River, China, trib. of Yang-tse-kiang, which it joins at Hankow. Rising in S.W. Shen-si, it flows E., receiving on the left the

Hei-lung (a river almost equal to the Han), the Tan, and the Pai. The last two rivers are navigable almost to their sources, and are the main trade routes from Han-kow to Si-an-fu and Ho-nan for Peking. The Han itself is navigable by steam-launches as far as Hsiang-yang, and by boats to above Han-chung (1,369 m.). South of Hsiang-yang the river bends due s., and the channel extends to over one mile in width, but as it approaches Han-kow it narrows to 200 or 300 ft. Strong embankments have been built to protect the country from inundations, which nevertheless frequently occur. (2.) River of Korea, flows from E. to W. into the Yellow Sea by two branches round Kang-ho I. It is navigable by steam-launch to Seoul.

Hanau, tn., prov. Hesse-Nassau, Prussia, at the confluence of the Kinzig with the Main, 14 m. by rail E. of Frankfurt-on-the-Main; is famous for its jewellery and goldsmiths' and silversmiths' work, and for its diamond-cutting. Hanau is the birthplace of Jakob and Wilhelm Grimm. The town has iron foundries, engineering works, and breweries. Hanau had a chequered history during the Thirty Years' war, and in 1813 was the scene of a series of engagements between the Bavarian general Wrede and Napoleon. Pop. (1900) 29,847.

Hanbury, SIR JAMES ARTHUR (1832), English army surgeon (1853-92). He saw service in the Afghan war of 1878-80, taking part in Lord Roberts's march to Kandahar, and was present at the battle of Kandahar (1880). He was also in the Egyptian war of 1882.

Hanbury, RIGHT HON. ROBERT WILLIAM (1845-1903), English politician, entered the House of Commons (1872) as member for Tamworth, and afterwards sat for N. Stafford (1878-80), and Preston (1886-1903). Until promoted to the Treasury Bench (1895) as financial secretary to the Treasury, he was a keen critic of the estimates. On his initiative many civil service abuses were swept away, and much accomplished in the direction of army reform. As representative in the Commons of the Postmaster-general, Mr. Hanbury had to carry through the post-office scheme of telephone communication (1899), having previously presided over a select committee on telephone service (1898). In 1900 Lord Salisbury made him President of the Board of Agriculture, with a seat in the cabinet—an appointment confirmed by Mr. A. J. Balfour (1902).

Hancock, WINFIELD SCOTT (1824-86), American soldier, born at Montgomery Square, Pennsyl-

vania; served in the Mexican war (1847). Appointed brigadier-general of volunteers at the outbreak of the civil war, he handled his troops so brilliantly at Williamsburg (May 1862) that he was named 'Hancock the Superb.' At Antietam (November), Fredericksburg (December 1862), and Chancellorsville (May 1863) he bore the brunt of battle; and through his courage and promptness defeat was averted at Gettysburg (July 1863), where he beat back Longstreet's famous attack, although he was desperately wounded. Appointed major-general of regulars (1866), his policy while commanding in the South was liberal and conciliatory. Nominated for the presidency as a Democrat, he was defeated by Garfield (1880). See F. A. Walker's *General Hancock* (1894).

Hand. The manus, or hand, is the terminal segment of the anterior limb of many vertebrates. The name is, however, usually applied to the human manus, as distinguished from that of lower animals. Its skeleton consists of eight carpal or wrist bones, five metacarpal or palmar bones, and fourteen phalanges, three of which are in each finger and two in the thumb. The large number of muscles and joints in the hand allows of movements of great delicacy and intricacy, and at the same time of considerable strength, while the nerve supply is so rich as to render the hand the principal organ of the sense of touch. Its powers as a prehensile organ are largely due to the opposability of the pollex or thumb, and are so early developed that a child only a few hours old has a grasp strong enough to support its own weight for some seconds.

Deformities of the hand may be congenital or acquired. The congenital deformities are usually the lack or the excess of parts. Thus some have extra fingers on one or both hands; others have fingers or joints (*i.e.* phalanges) wanting. Fingers are sometimes joined by a web of connective tissue and skin, which runs up for a varying distance toward the tips. Most congenital defects or deformities are hereditary. Acquired deformities result from accident or from disease. Gout, rheumatism, and rheumatic arthritis attack the joints chiefly, or the bones at their articular ends; myxœdema makes the whole hand coarse and thick; and tubercular disease produces a characteristic clubbing of the nails and tips of the fingers. The nails often show traces of severe illness or chronic disease, being brittle, ridged, and broken. The habit of right-handedness or left-handedness seems to depend

very much upon practice and education. True left-handedness

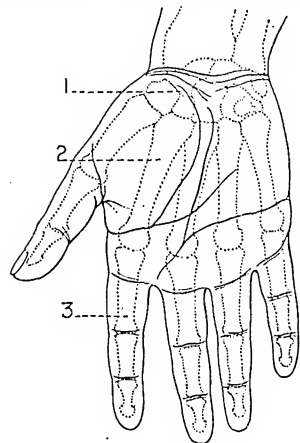


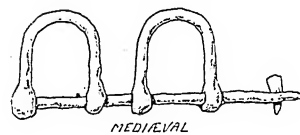
Diagram of the Hand.

1, Carpal bones; 2, metacarpal; 3, phalanges.

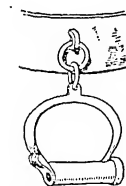
is not uncommon, and runs in certain families. An ambidextrous condition of the hands is much more rare, although careful training of the left hand, such as a violinist practises, brings a degree of efficiency almost equal to that of the right.



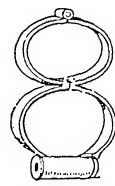
ANCIENT ROMAN



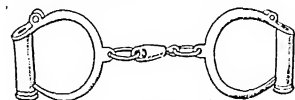
MEDIEVAL



HANDCUFF ATTACHED TO WAISTBAND From Old Hologate.



DOUBLE HANDCUFF From Old Hologate (Hologate).



MODERN Handcuffs.

Handcuffs, for securing prisoners, usually consist of two

divided metal rings, made with ratchets (so as to be adjustable to wrists of different sizes), and connected by a short chain, being used either to fasten the hands of the prisoner together, or to secure him to the wrist of the officer in charge. In some forms of handcuffs which have come into use in recent years one part only is made to fit on the prisoner's wrist, the other part forming a handle, grasped by the officer. Some of these handcuffs are so made that they can be placed upon the wrist and instantly fastened by a single movement. A constable is not justified in handcuffing a person arrested on suspicion, even of felony, unless the prisoner has attempted to escape, or circumstances exist to arouse suspicion that he will do so, or become violent.

Handel (in German HÄNDEL), GEORGE FREDERICK (1685-1759), musical composer, was born at Halle-an-der-Salle, Lower Saxony. He early showed a strong predilection for music, and in 1703 he became a violinist in the opera at Hamburg. Having produced four operas at Hamburg, he undertook a journey to Italy (1707-10), to study what were then regarded as the classical models of composition. What he there learned coloured his style for the rest of his life. His first real Italian opera, *Rodrigo*, produced at Florence (1707), was followed by *Agrippina*, produced at Venice (1708), and an oratorio, *La Resurrezione*, supposed to have been performed in the palace of Cardinal Ottoboni at Rome (1708). The visit to Italy ended in 1710, when he repaired to Hanover as music director to the elector (afterwards George I.). His first appearance in England was with *Rinaldo*, produced at the Haymarket with unusual magnificence (February 1711). Next year he produced two new operas, *Il Pastor Fido* and *Teseo*. The peace of Utrecht led to the composition of his first works set to English words, a *Te Deum* and a *Jubilate*, performed in St. Paul's Cathedral (July 1713). He found a patron in the Duke of Chandos (1717), who employed him to direct the music at his private chapel at Cannons Park, near Edgware. Here he produced the *Chandos Anthems*, two settings of the *Te Deum*, his first English oratorio *Esther* (August 1720), the pastoral *Acis and Galatea*, and the first set of *Suites de Pièces*, which contains the famous 'Harmonious Blacksmith.' Leaving Cannons Park, he became director of a new operatic venture called 'The Royal Academy of Music,' for which he wrote no fewer than fourteen operas,

among them *Ottone*, with its familiar gavotte, and *Scipio*, with its still popular march. This venture collapsed (1728), but Handel tried a similar one at his own risk, renting the King's Theatre, for which several operas were written, and a second English oratorio, *Deborah*, produced in 1733. This year a rival opera-house was opened, with the avowed intention of ruining Handel, and the contest was kept up until 1737, when Handel abandoned his enterprise, having lost over £10,000. After that the composer's attention was directed almost solely to oratorio. *Saul* was produced in 1739, and *Israel in Egypt*, with its great descriptive choruses, some months later. On April 13, 1742, the *Messiah* was produced in Dublin. This splendid work was written in the short period of twenty-four days. Another oratorio, *Samson*, was given in London in February 1743. The most important of the later works were *Judas Maccabaeus* (1746), *Joshua* (1747), *Solomon* (1748), *Theodora* (1749), and *Jephthah* (1751). During the last seven or eight years of his life Handel was afflicted with total blindness. He died in London, and was buried in Westminster Abbey.

In person, as in character, Handel was large and powerful. His temper was volcanic, but a deep religious sense was one of his strongest characteristics. As a composer he is seen at his best in his oratorios, notably in the choruses. No one has ever better understood how to get great choral effects by simple means. His style is direct and vigorous, not lacking in dramatic power, and occasionally, as in some of his oratorio airs, marked by deep emotional feeling. His works have always been more popular in England than elsewhere, and on the Continent he is now practically neglected. The Handel Triennial Festival at the Crystal Palace has long been a recognized institution. The best biography in English is by W. S. Rockstro (1883); and the best in any other language, the German *Life* by Chrysander (3 vols. 1858-67).

Handfasting, the name given to a kind of provisional or temporary marriage, signified by joining hands, formerly not uncommon in some parts of Scotland. The custom is thus described by Sir Walter Scott: 'When we (Bordermen) are handfasted, we are man and wife for a year and a day; that space gone by, each may choose another mate, or, at their pleasure, may call the priest to marry them for life' (*The Monastery*, ch. xxv.).

Handicap. Handicaps take various forms. In some cases an additional weight has to be car-

ried, as in horse-racing; in others a greater distance has to be covered, as in foot-races; in others, again, a shorter time is allowed for covering the same distance, as in some yacht races. Other forms of handicap are used in shooting, where some of the competitors have to shoot from a greater distance; in cricket, where the number of players on one side is sometimes less than the number on the other; in billiards, where one player may have to make a greater number of points than another, and so on. In horse-racing, handicaps were not common in England till after the beginning of the 19th century. At one time all the horses in a race carried the same weight, irrespective of age. Later, 'weight-for-age' races were introduced. In these the amount of weight to be carried varied with the age of the horse. Next, as it was found that owners would not enter for races in which horses admittedly superior to their own were to take part, handicapping based on the actual (or supposed) merits of the horses came into fashion. In some races the official handicapper of the Jockey Club, in others handicappers licensed by the Jockey Club, decide the weights to be carried. After the weights have been published, those who consider that their horses have been unfairly handicapped are at liberty to withdraw without forfeiting their entrance-money. Those who are content to remain in signify their 'acceptance.' Under the Jockey Club rules the minimum weight to be carried in any race is six stones.

Handsel, a term used in Scotland to signify, generally, the delivery of something which is the first of a series; more particularly it means (1) presents made to servants and children on the first Monday of the new year (Handsel Monday); (2) earnest-money, paid to bind a bargain. In the latter sense it was formerly used also in England. The old pronunciation was *handsele* = *handseal*.

Handsworth, n.w. suburb of Birmingham, England. Pop. (1901) 52,921.

Handwriting. See **WRITING**.
Hang-chau-fu, cap. of Chekiang, China, at the s. terminus of the Grand Canal, on I. bk. of Tsien-tang R.; one of the most beautiful cities in China. It is a great centre of the silk trade, and fans and tinfoil are its special industries. It was opened to foreign trade in 1856. From 1127 to 1278 A.D. it was the capital of the S. Sung dynasty, and is identified with the Kinsay of Marco Polo. Pop. (1901) estimated at 750,000.

Hanging. See CAPITAL PUNISHMENT.

Hanging Gardens of Babylon, anciently reckoned one of the seven wonders of the world, were situated within the great palace of Nebuchadnezzar in Babylon. They consisted of several acres of flower-gardens, groves, and avenues of trees, with fountains and banqueting-rooms interspersed, and were raised, terrace-like, on tiers of masonry arches, to heights varying from 75 to 300 ft. above the plain. They were irrigated from a reservoir situated at the top, and supplied with water from the Euphrates by means of a screw. The hanging gardens are generally ascribed to Nebuchadnezzar, though some have maintained that they were the work of Semiramis.

Hangnest, a name given to the members of the sub-family Icterinae, which are passerine birds found in America. The Baltimore hangnest, or Baltimore oriole (*Icterus Baltimore*), is an example. Like all its allies, it is a handsome bird, the plumage being always glossy black, with yellow or orange patches. The nest is suspended from a branch, and is woven of blades of grass, tendrils, and so on. The birds are good songsters, and are often kept in captivity.

Hangö, port of Finland, at the N.W. extremity of the Gulf of Finland. The principal articles of export are beer, fish, wood, and horses. With the aid of the ice-breaker the harbour is kept open all the year. Pop. (1897) 2,500. Off Hangö on July 15, 1714, a Russian fleet under Count Apraksin, with the Czar Peter as rear-admiral, defeated a Swedish fleet under Admiral Ehrenschild. In the Crimean war (1854-6) the works near Hangö Head were more than once engaged by British ships.

Hankow, tn. and treaty port in prov. Hu-peh, China, on l. bk. of Han, at its junction with the Yang-tse-kiang, and facing Han-yang on l. bk. and Wu-chang on r. bk. of Yang-tse-kiang. It is an important centre of Chinese trade, and the central market of the tea districts of the Yang-tse-kiang. It also exports hides, vegetable tallow, rhea fibre, hemp, bristles, and Chinese medicines. Exports valued at £10,266,806 in 1905, and imports at £9,758,255. The railroad to Peking (776 m.) was completed in 1905. Over two miles of river frontage belongs to the British and other foreign concessions. These have been embanked with stone to protect them from a 40 ft. rise of the river in summer. Pop. between 600,000 and 800,000.

Hanley, 'the metropolis of the Potteries,' parl. bor. (1885), co. bor. (1888), munic. bor. (1887), and mrkt. tn., N.W. Staffordshire, England, 1½ m. N. of Stoke-upon-Trent. Its growth is entirely due to the pottery industry; there are collieries and iron works. It possesses a fine town hall, free library, technical museum, municipal school of art, science, and technology, and three public parks. Burslem is included in the parl. bor., which returns one member to the House of Commons. Pop. (1901) 61,599.

Hanna, WILLIAM (1808-82), British theologian and biographer, son of a Belfast theological professor. He became colleague to Dr. Guthrie in St. John's Free Church, Edinburgh (1850), where he was one of the popular preachers of the day. After resigning this post (1866) he removed to London, where he died. His literary and spiritual power—e.g. in *Last Day of our Lord's Passion* (1862)—attracted many readers, and by his edition of the *Letters of Thomas Erskine of Linlathen* (1877-8) he revealed the breadth of his sympathies. He is best known, however, by his *Memoirs of Dr. Chalmers*, his father-in-law (5 vols. 1849-52).

Hannah, the mother of the prophet Samuel. Her song (1 Sam. 2:1-10) is by many critics believed to date from a later time.

Hannay, JAMES (1827-73), Scottish author, born at Dumfries; became a reporter for the *Morning Chronicle*, and in 1860 editor of the *Edinburgh Evening Courant*. In 1868 he was appointed British consul at Brest; afterwards transferred to Barcelona, where he died. He was the author of two naval stories, *Singleton Fontenoy* (1850) and *Eustace Conyers* (1855), and of several volumes of criticism—e.g. *Lectures on Satire and Satirists* (1854), and *Essays from the Quarterly Review* (1861).

Hannen, JAMES HANNEN, LORD (1821-94), English judge, born at Peckham, London. Called to the bar (1848), he soon obtained a good practice. In 1868 he was made a judge of the Queen's Bench, in 1872 was transferred to the Probate and Divorce Courts, and in 1888 presided over the Parnell Commission. He was made a lord of appeal in 1891, and in 1892 acted as arbitrator in the Bering Sea seal fisheries question.

Hannibal, a British first-class battleship (14,900 tons) launched at Pembroke in 1895.

Hannibal, city, Marion co., Missouri, U.S.A., on the Mississippi, 110 m. N.W. of St. Louis. It exports tobacco, timber, and agricultural products. Pop. (1900) 12,780.

Hannibal (247-183 B.C.), Carthaginian general, and one of the greatest military geniuses of antiquity, was the son of Hamilcar Barca. When he left Carthage for Spain with his father in 238 B.C., the latter made him swear undying hostility to the Roman name; and he faithfully kept his oath. After his father's death (228) he served in Spain under his brother-in-law, Hasdrubal; and when Hasdrubal was murdered (221) he was called to the chief command. After spending two years in securing his base in Spain and training his troops, he attacked and, after a siege of eight months, took Saguntum, with the deliberate intention of provoking war with Rome. Hannibal entered on his march to Italy with about 90,000 infantry, 12,000 cavalry, and 37 elephants. He left New Carthage about the beginning of May, 218 B.C., and crossing the Pyrenees lost 20,000 men: One of the most disputed questions of ancient history is that of the pass by which he crossed the Alps; on the whole, probabilities point to the road by Mont Genève, or the Col de l'Argentière. Anyhow, only 20,000 of his foot and 6,000 of his horse survived to reach Italy. The Roman general Scipio, who had come north to stop him, was defeated in a skirmish near the river Ticinus, and soon afterwards near the Trebia, when he lost 20,000 men (about December 218). After a short rest Hannibal crossed the Apennines and the marshes of the Arno with great suffering, he himself losing an eye from ophthalmia, and got south of the Roman consul Flaminius, who was entrapped into an ambush at the Trasimene Lake, and perished with most of his army. After the victory Hannibal marched south into Apulia, then into Campania, where he was almost cut off by Fabius, escaping only by a stratagem. In the next year (216), after wintering in Apulia, he gained the great victory at Cannæ, in which probably at least 50,000 of the Roman army of 80,000 fell, and 20,000 were taken prisoners. It has often been said that had Hannibal immediately advanced against Rome he would have taken the city and ended the war; but facts are against this view. The reward of his victory was the accession of the Lucanians, Bruttians, most of the Samnites, and Capua, where he wintered. The luxury of that city is popularly supposed to have proved the ruin of his troops; but it was not Capua that ruined Hannibal—it was the resolution of Rome, and the fact that he could no longer entice her generals to decisive battles. He was ham-

pered by the Roman fortresses, and had to fight continually to maintain his position, but could secure no definite success. In 212 he captured the town of Tarentum; but he failed to raise the siege of Capua, which fell in 211, though he made a sudden march to the gates of Rome. In 207 came the crisis of the war. Hannibal's brother Hasdrubal invaded Italy from Spain, but before he could join Hannibal he was met by the Roman consuls Livius and Claudius at the river Metaurus, and decisively defeated; his army was practically annihilated, and he himself perished. For four years more Hannibal maintained his position in Bruttium; but finally the successes of the younger Scipio in Spain and his invasion of Africa called him home. He sailed from Croton in the autumn of 203 B.C., having for fifteen years held his own in Italy without a single serious defeat. But in 202 he fought the decisive battle at Zama in Africa against Scipio, and was utterly defeated, and at once urged his country to make peace. During the next few years Hannibal laboured for the restoration of his country, reforming the government and reorganizing the finances. But in 195 B.C. Rome demanded his surrender, and to avoid that he took refuge with Antiochus the Great of Syria, who in 192 engaged in war with Rome. Hannibal's last appearance in war was in command of a fleet, which the Rhodians defeated off Aspendus in 191. Then the submission of Antiochus forced Hannibal to seek a new protector, and he fled to Prusias, king of Bithynia, with whom he lived, until the Romans sent Flamininus to demand his surrender. Thereupon Hannibal, seeing that escape was impossible, took poison (183 B.C.). Hannibal displays all the qualities of the highest military genius—breadth of strategy, untiring energy, and rapidity of action, and consummate handling of his troops upon the field. His private character has been much maligned by Roman historians; but an impartial view clears him of their charges of treachery and barbarity. He was, in fact, in advance of his time in humanity; and if he was avaricious, it was to support the war, not for himself. See Hennebert's *Histoire d'Hannibal* (1870-92); Dodge's *Hannibal* (1891); Morris's *Hannibal* (1897).

Hannington, JAMES (1847-85), English bishop, born at Hurstpierpoint, Sussex; took charge for six years of the church his father built there, but in 1882 he led a mission party to Uganda

in E. Africa, and was appointed bishop of Eastern Equatorial Africa (1884). His attempt to open up a shorter way through the Masai country to the Victoria Nyanza roused the fears of Mwanga, king of Uganda, who caused him to be murdered. See *Life* by E. C. Dawson (1887), and his *Last Journals* (1888).

Hanno. (1.) THE GREAT, the leader of the aristocratic party at Carthage from 240 to 200 B.C., and the chief opponent of Hannibal and his family. (2.) A Carthaginian navigator, who sailed through the Strait of Gibraltar, and on his return published an account of his voyage, a Greek version of which, called the *Periplus*, is still extant. His most probable date is about 480 B.C. See edition by Falconer, with English translation (1797).

Hanoi, cap. of Tong-king and (since 1902) of French Indo-China, on r. bk. of the Red River, 93 m. from the sea. Since 1892 the old Annamese town has been replaced by a modern-built European town. It is the chief commercial centre of the country. It manufactures silks, cottons, embroideries, furniture, and jewellery, and has a cathedral. Founded about 767 A.D., Hanoi was long the capital of Annam. Pop. over 100,000.

Hanotaux, GABRIEL (1853), French statesman and author, born at Beaurevoir, Aisne. An article of his in *La République Française* attracted Gambetta's notice, who gave him a post in the Foreign Office, and later a position in his cabinet. He was elected deputy for Aisne (1886), but lost his seat in 1889. In 1894 he took the post of minister for foreign affairs, which he held till 1898 with exceptional success. He was elected to the Academy in 1897; his literary *chef-d'œuvre* is the *Histoire du Cardinal de Richelieu* (vols. i., ii. 1893-1903), which gained him the Gobert Prize—the highest honour bestowed by the Academy. He has also written *La France Contemporaine* (Eng. trans. by J. C. Tarver, 2 vols., 1903-5).

Hanover. (1.) Province of Prussia, stretches from the Netherlands E. to the Elbe, and from the North Sea s. to Hesse-Nassau, including the former duchy of E. Friesland, the Lüneburg Heath (55 m. long), part of the Harz Mts., and outliers of the Weser Mts. (400 to 1,700 ft.). The soil beside the rivers (Elbe, Weser, Ems, Aller, and Leine) is fertile; the greater part is, however, moorlands. Large areas of these have been recently drained and reclaimed. Cattle are bred and grazed on the marshes next the North Sea. One-sixth of the area is covered with forest. Coal,

iron, zinc, lead, copper, and salt are mined in the Harz Mts. and elsewhere. Ironware and steel goods, textiles, sugar, machinery, gutta-percha and india-rubber, chemicals, scientific instruments, beer, and spirits are the more important products of manufacturing industry. Geestmünde is one of the chief fishing ports of Germany. Commercial ports exist at Emden, Harburg, Papenburg, and Leer. There are a university at Göttingen and a polytechnic at Hanover. Area, 14,865 sq. m. Pop. (1905) 2,759,699. (2.) Town, Prussia, cap. of above prov., and headquarters of the 10th German Army Corps, stands at the intersection of the high-ways (and railways) from Hamburg to Frankfort-on-Main, and from Berlin to Köln, 112 m. by rail s. of Hamburg, and 163 m. w. of Berlin. During the last quarter of the 19th century the town grew at a remarkable rate. It has large factories for india-rubber and gutta-percha goods, for iron-founding and making machinery and hardware, and for producing linens, chemicals, tobacco, books, furniture, etc., and breweries. Several of these are in the sister town of Linden (pop. 50,628 in 1900), on the s.w. On the E., beyond the old town, are the parks and woods of Eilenriede (over 1,600 ac.). The old town still possesses several 14th, 15th, and 17th century buildings, as the former royal palace, the chancellery of justice, and the house of Leibniz, now converted into an industrial art museum. Intermingled with these are a number of quite new structures (1876 to 1901), as the fine railway station, the Kestner Museum (archæological), post office, Reichsbank, provincial (Hanover) museum, archives and royal library, and the royal playhouse (1845-52). Hanover has a famous polytechnic, housed in the Welf (Guelf) Castle (1837-66), and attended by over 1,500 students. Here is the Herrenhausen Castle (1698), with splendid gardens, etc., the favourite residence of Kings George I., II., and V. Hanover has also a high school for girls (1899) and a mint. The Duke of Celle chose it for his residence in 1636, and it remained a capital city from that date down to 1866, though between 1714 and 1837 the electors of Hanover sat on the English throne. Pop. (1871) 87,641; (1905) 250,032. (3.) Division of Cape Colony, S. Africa. The town stands at an elevation of 4,500 ft., and is 400 m. N.E. of Cape Town. Pop. of div. 4,301; of tn. 500. (4.) Post bor., York co., Pennsylvania, U.S.A., 17 m. S.E. of Gettysburg; has manufactures of carriages and machinery. Pop. (1900) 5,302.

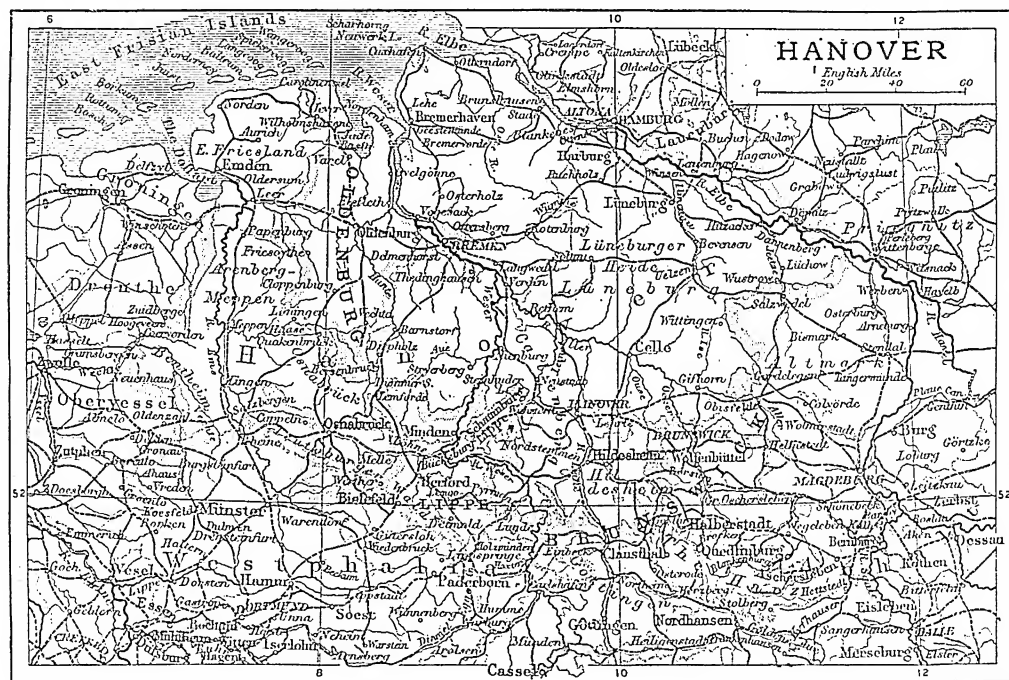
Hans, king of Sweden. See JOHN II.

Hansard, LUKE (1752-1828), English printer, born at Norwich. He printed the works of Burke and Dr. Johnson, and for more than half a century the records, also, of bills before Parliament, the reports of committees, parliamentary debates, and the national accounts. The business was continued by his sons James and Luke, and was afterwards transformed into a limited company, which was wound up in 1892. See *Biography* (1829).

Hansa Steamship Line, established at Bremen in 1880, conducts a cargo service between

merce, and in the 13th century Wisby, on the island of Gothland, had grown into a flourishing town with a considerable eastern trade. Before the end of that century, however, Lübeck, Rostock, Wismar, Stralsund, and Greifswald had begun to play a more or less prominent part in the trade of the Baltic; and Lübeck, at all events, soon rivalled, and eventually surpassed, Wisby itself. On the North Sea, Bergen, London, and Bruges were the principal foreign markets frequented by German traders; in the first of these they monopolized the entire trade of Norway. In the west, Cologne, which was for

league, deriving strength from the exigencies of concerted action, soon began to acquire political power. Lübeck gradually came to be the headquarters and centre of its activity. Denmark was for many years the only serious rival the league had to encounter on the sea. Eventually the aggressions and ambition of Waldemar IV. (1340-75) forced it into a war with Denmark. The traders proved the stronger, and in 1370 the treaty of Stralsund subjected Denmark to the domination of the league. In 1375 the Emperor Charles IV. spoke of Lübeck as one of the five chief towns of the empire. In the

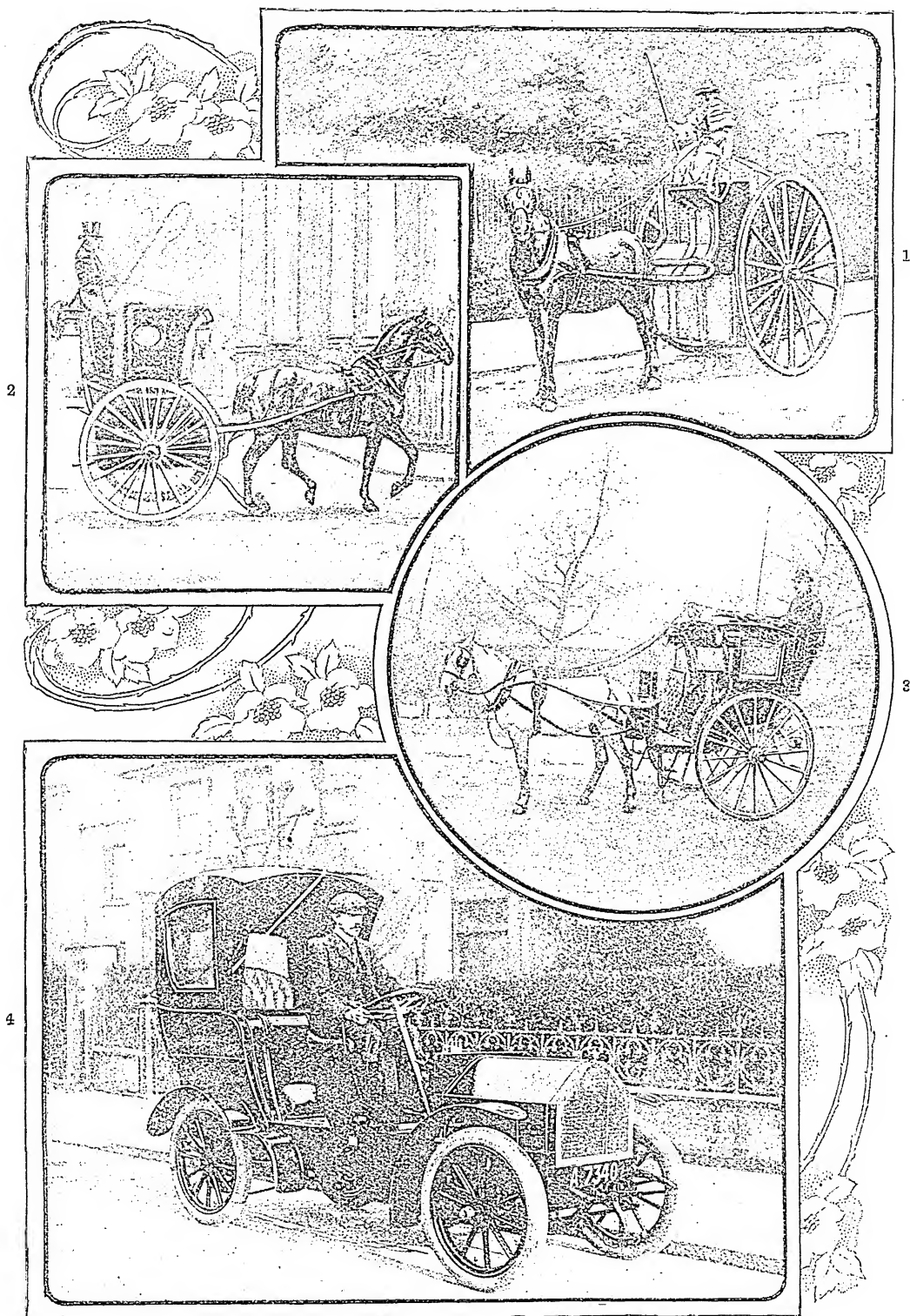


Bremen and other continental ports and India, also between Bremen and Argentina. The company owns a fleet of fifty steamers, aggregating 215,000 tons.

Hanseatic League, an association of North German trading towns, which in one form or another existed from the 12th century to the 16th. The word *hansa* implies an association or guild, and usually means a merchants' guild. The Hanseatic League was a league of towns chiefly for the purposes of trade, though with this political objects were sometimes associated, as at Bergen and Wisby. The Baltic and the North Sea had early become important highways of com-

merce, and in the 13th century Wisby, on the island of Gothland, had grown into a flourishing town with a considerable eastern trade. Before the end of that century, however, Lübeck, Rostock, Wismar, Stralsund, and Greifswald had begun to play a more or less prominent part in the trade of the Baltic; and Lübeck, at all events, soon rivalled, and eventually surpassed, Wisby itself. On the North Sea, Bergen, London, and Bruges were the principal foreign markets frequented by German traders; in the first of these they monopolized the entire trade of Norway. In the west, Cologne, which was for

15th century the power and influence of the Hanseatic League began to decline. By the end of Henry VII.'s reign the English were making their rivalry felt in Norway as well as in the Baltic. At the same time, the importance of the western towns of the league increased, while that of the Baltic towns declined. The herrings, so long a source of profit to the eastern Hanseatic towns, moved to the Dutch coast. Moreover, Germany was never formed into a united kingdom, but always remained a federation of princes. As each principality became more independent of the emperor, and fell more under the rule of its own prince, the liberties of its traders



The Development of the Hansom Cab.

1. The original hansom. 2. Harvey's improved cab, 1844: seats for three, and door at back. 3. Modern hansom. 4. Motor hansom.

became more circumscribed, and its towns were compelled to dissociate themselves from the league. This growth of territorialism in Germany, combined with foreign competition, and the geographical discoveries of the age, broke up the Hanseatic League. Lübeck, Hamburg, Bremen, and a few others have, however, retained the name of Hanse towns down to the present (20th) century. See Schäfer's *Die Hanse* (1903); Lindner's *Die deutsche Hanse* (1899); the older histories of Sartorius, *Geschichte des hanseatischen Bundes* (1802-8), and Lappenberg's *Geschichte des hansischen Stadhofes zu London* (1851); and in English, Helen Zimmern's *The Hansa Towns* (1889).

Hansen, CARL F. S. See SUNDT-HANSEN.

Hanse Towns. See HANSEATIC LEAGUE.

Hansi, tn., Hissar dist., Punjab, India, on a branch of the Western Jumna Canal, 83 m. W.N.W. of Delhi. From 1807-57 it was a British cantonment. Pop. (1901) 16,523.

Hansom, JOSEPH ALOYSIUS (1803-82), English architect, a native of York, who found his true sphere in architectural work, ecclesiastical and domestic, chiefly for the Roman Catholic Church. His name is preserved in the 'hansom' cab, for which invention (1834) he received only £300. See *Builder*, July 8, 1882: he started this journal in 1842.

Hansom Cab. Cabriolets, or cabs, small two-wheeled carriages, holding two passengers and a driver, were introduced into England from France at the beginning of the 19th century. The original 'hansom' cab (1834) was very different from the vehicle now known by that name. The essential parts of Hansom's invention were the use of the suspended axle, and of very large wheels. The seat at the back for the driver was not in the original patent.

Hansson, OLA (1860), Swedish author, born at Hönsinge in S. Sweden; settled at Berlin. All his earlier works—*Dikter* (1884), *Literära Silhouetter* (1885), *Notturno* (1883), and *Sensitiva Amors* (1887)—display a morbid sensibility. As a critic Hansson has done some excellent work—e.g. *Der Materialismus in der Literatur* (1892), *Scher und Deuter* (1894). In September 1889 he married Laura Mohr, a talented author of the advanced school, who writes under the pseudonym of Laura Marholm. His later books include *Friedrich Nietzsche* (1890); *Fru Ester Bruce* (a novel, 1893); *Ung Ojavs Visor* (Eng. trans. by George Egerton, 1895); *Amors Hævn* (1894).

Hansteen, CHRISTOPHER (1784-1873), Norwegian astronomer, born at Christiania, was appointed (1814) to the chair of astronomy in the university of that town. He published in 1819 his great work, *Untersuchungen über den Magnetismus der Erde*, and prosecuted his researches during an exploring journey (1828-30) in Siberia. The results of this journey appeared in 1863 as *Resultate magnetischer. . . Beobachtungen auf einer Reise nach Sibirien*. On his return to Christiania he superintended the erection of a new public observatory, and directed, from 1837, the survey of Norway.

Hanswurst, the traditional buffoon in old German comedy, had long been an important figure on the national stage, when his supremacy became threatened, about 1737, by the revival of better plays by the Neuber company, and he was pretty well laughed out of existence by Gottsched (1700-66). Clumsy, greedy, and boisterous, he corresponded to 'Jack Pudding' in English.

Hanthawadi, or HANTHAWADDY, dist., Pegu div., Lower Burma; created a separate district in 1880. It has an area of 3,023 sq. m., and in 1901 had a population of 484,811. The principal river is Hlaing or Rangoon. Rice is largely grown. The capital is Rangoon.

Hants. See HAMPSHIRE.

Hanuman, the monkey god of the Hindus, and one of the heroes of the epic the *Rāmāyana*. He constructed a causeway between India and Ceylon to assist Rāma (Vishnu) to recover his wife Sītā. The greater part of the Deccan is reputed to have been colonized by him and his followers. He is a favourite deity in the Maratha country, where every village has his image.

Hanway, JONAS (1712-86), English philanthropist and traveller, a native of Portsmouth, who was a merchant successively in Lisbon, London, and St. Petersburg, and distinguished himself by a venturesome caravan ride into Persia (1743-5), an account of which he published in *Historical Account of the British Trade over the Caspian Sea* (1753). After his return (1750) to London he spent his time chiefly in bettering the condition of chimney sweeps, pauper infants, Magdalen asylums, etc., and in advocating Sunday schools. He was also co-founder of the Marine Society (1756). He was the first man who regularly carried an umbrella in London. His zeal in attacking the use of tea brought down rebukes from Johnson and Goldsmith. See *Life* by John Pugh (1787 and 1798), and Austin Dobson's *Eighteenth-Century Vignettes* (1892).

Hanwell, par., Brentford div., Middlesex, England, 10 m. W. of St. Paul's. In the adjoining parish of Norwood is situated Hanwell Lunatic Asylum (1831). Pop. (1901) 10,437.

Han-yang-fu, city, prov. Hupeh, China, at junction of Han R. with the Yang-tse-kiang, and opposite Hankow and Wu-chang. It contains large iron works and a small-arms manufactory. Pop. about 200,000.

Haparanda, tn., Sweden, Norbotten co., 2 m. N. of the mouth of the Torneå. Its harbour is at Salmis, on the Gulf of Bothnia, 7 m. distant. Pop. (1900) 1,568.

Haplodon, a genus of primitive rodents, including two species known as sewellels. The common sewellel, *H. rufus*, is found only in a narrow strip of country on the north-west coast of N. America. It is about a foot in length, and lives in burrows in moist ground. The Californian form, *H. major*, is about sixteen inches long, and is beaver-like in its habits, being found in the vicinity of running water, and constructing burrows in which the animals live. Structurally the sewellels seem to be intermediate between squirrels and beavers, but their nearest affinities are with the squirrels. On account of the peculiar characters, especially of the teeth, they constitute a family by themselves.

Hapsburg, or HABSBURG, HOUSE OF. The castle of Hapsburg, on the Aar, in the Swiss canton of Aargau, gave the name to a most illustrious German family. Albert, Count of Hapsburg, was the first distinguished member of the race, and his son Rudolph became emperor in 1273. He increased the possessions of his own house by seizing Upper and Lower Austria, Styria, and Carinthia; and Carinthia and Tyrol were added about half a century later. From 1437 to 1806 all the emperors, with the exception of Charles VII. (1742-45), were Hapsburgs. Under the Emperor Charles V. Spain was united to the Hapsburg dominions, but on his abdication in 1556 it was again placed under a separate ruler. The Thirty Years' war was, in its earlier phases, an attempt on the part of the Hapsburgs to destroy the imperial elective constitution, and to form a vast hereditary dynastic empire which should include all Germany. An attempt to place a Hapsburg on the throne of Spain after the death of Charles II., in 1700, was foiled, though at the peace of Utrecht the Emperor Charles VI. obtained the Spanish Netherlands and the Spanish possessions in Italy. On his death, in 1740, Maria Theresa, his daughter, was unable to re-

sist Frederick the Great's seizure of Silesia, or to secure the election of her husband as emperor. In 1743, however, she succeeded in the latter aim, and the house of Hapsburg-Lorraine continued till 1806 to provide emperors. Since 1806 the Hapsburgs have ruled Austria and Hungary only. See Lichnowski's *Geschichte des Hauses Habsburg* (8 vols. 1836-44); Schulte's *Geschichte der Habsburger in den ersten drei Jahrhunderten* (1887); Redlich's *Rudolf von Habsburg* (1903); and Wagner's *Rudolf von Habsburg* (1904).

Hapur, or HAUPUR, munic. tn., Meerut dist., United Provinces, India, 20 m. S.E. of Meerut; exports sugar, cotton, and grain. Pop. (1901) 17,796.

Harafuras, East Indies. See ALFURAS.

Hara-Kiri (incorrectly spelt HARI-KARI), a method of suicide by disembowelling, formerly practised in feudal Japan, chiefly among the Samurai, or military class. Since 1868, when the feudal system was abolished, the practice has gone very largely out of fashion, but it is occasionally practised even at the present day.

Harbours and Breakwaters. A harbour is a sheet of water so protected from storms that ships may lie within it in safety. The construction of artificial works for the improvement or protection of naturally formed harbours or ports peculiarly well situated for commerce was not unknown to the maritime nations of antiquity. The Phœnicians constructed great works at Tyre and at Sidon, the breakwaters being mostly of loose rubble. Carthage, the daughter state of Phœnicia, possessed a famous double war-harbour, an inner and an outer; as also did her great rival, Rome, at Ostia at the mouth of the Tiber. In the making of harbours the Romans showed the same practical thoroughness and efficiency as they did in the construction of their roads. Other famous harbours in ancient times were those of Rhodes, Piræus (Athens), Alexandria, and Massilia (Marseilles). In the middle ages the commercial supremacy of Venice and Genoa led to the construction of harbour works of considerable magnitude at both those ports, and some of them still survive to the present day. Harbours may be divided into two classes—*natural* and *artificial*; and these, again, may be subdivided into harbours of refuge and commercial harbours.

Natural harbours are those which are protected from storms by the configuration of the coast-line, and their efficiency as such depends on the depth of water in the protected area, its size, the

width and shape of the entrance, and the angle which the line of entrance makes with the direction of the worst winds. The Bay of Rio de Janeiro, which runs in a northerly direction for fifteen miles, with a width varying from two to seven miles, surrounded as it is by high mountains, and having an entrance rather less than a mile in width, and protected on each side by bold headlands, forms one of the largest natural harbours in the world. For facility of entrance and complete shelter, Milford Haven in Wales is unequalled: it stretches inland for some ten miles, and has a minimum depth of eight fathoms at low-water spring tides, and in most places a depth of from fifteen to nineteen fathoms. The mouths of rivers such as the Thames, the Mersey, the Firths of Forth and Tay, the Seine, and the Potomac, form the most numerous class of natural harbours; but their efficiency is often diminished by the 'bar' which forms at the mouth, where the outgoing current of the river is checked by the ocean, and consequently the matter previously held in suspension or rolled along the bottom becomes stationary there, thus forming a ridge across the river.

Artificial harbours are those which depend upon breakwaters for their protection against the violence of the waves. One of the largest purely artificial harbours in the world is that which is being constructed by the British government at Dover. It will have a low-water area of 610 acres, including the commercial harbour, and will be capable of sheltering a whole fleet. The total length of the enclosing breakwaters will be rather over two miles.

Harbours of refuge are those which are situated in such a position that vessels may with safety obtain shelter in them under any conditions of wind and weather. They should possess a safe and easy approach and exit, and good anchorage ground in various depths of water.

Commercial harbours are, as the name implies, those specially adapted for the import or export of sea-borne commerce. It is not a necessity that commercial harbours should be capable of being entered at all states of the tide, though it is a great advantage if this be possible. They are provided with systems of docks, in which vessels can lie in quite still water, and discharge or load their cargo. They should be well supplied with cranes, jiggers, etc., for the shipment and discharge of goods; have ample quay space, shed and warehouse accommodation; and should also be supplied with dry

docks, so as to allow any necessary repairs to vessels being carried out expeditiously. Certain commercial harbours, such as Antwerp, Rotterdam, and Hamburg on the Continent, Blyth and Sunderland in the north of England, and Dundee in Scotland, have their quays or wharves built along the river-banks.

Situation.—In the construction of harbours the first point to be considered is the site. This may be arbitrarily fixed—e.g. by nearness to a certain centre of trade—or the whole coast-line within certain limits may have to be carefully examined to determine the best position for the harbour, as in the case of a harbour of refuge. In either case a careful survey, both land and marine, of the proposed site must be made; the direction and velocity of the currents in the vicinity ascertained by means of float observations; and the directions of the prevailing winds and heaviest storms noted. Where the harbour is situated on the coast-line, an outer harbour protected by breakwaters must be built to allow of the water being sufficiently stilled before it enters the inner harbour, where vessels discharge their cargo. The width and depth of the entrance and its direction as regards the heaviest storms, the size of and depth of water in the enclosed area, and the line of the enclosing piers or breakwaters must be most carefully considered. The entrance should be placed seawards of every other part of the works. It is usually placed either pointing directly out to sea, or in such a direction as to admit of vessels taking it freely when running before the wind; but care must be taken that it does not admit waves so heavy as to be incapable of being stilled in the enclosed area.

The width of the entrance varies from 100 ft. upwards. The Peterhead harbour of refuge has an entrance 600 ft. wide, the area of the harbour being 340 ac. It is proposed to have two entrances to the national harbour of refuge at Dover—one being 800 ft. wide, and the other 600 ft. wide. If the position of the harbour is such that a stilling basin is required, it should have sufficient width to allow of the proper expansion of the waves, and a depth inland such that a vessel with full way on can shorten sail, or if necessary alter her course, to make the entrance to the inner harbour. The late Mr. Stevenson drew up formulæ for determining the reduction produced in the enclosed area on waves at any given distance not less than fifty feet from the entrance, after passing through

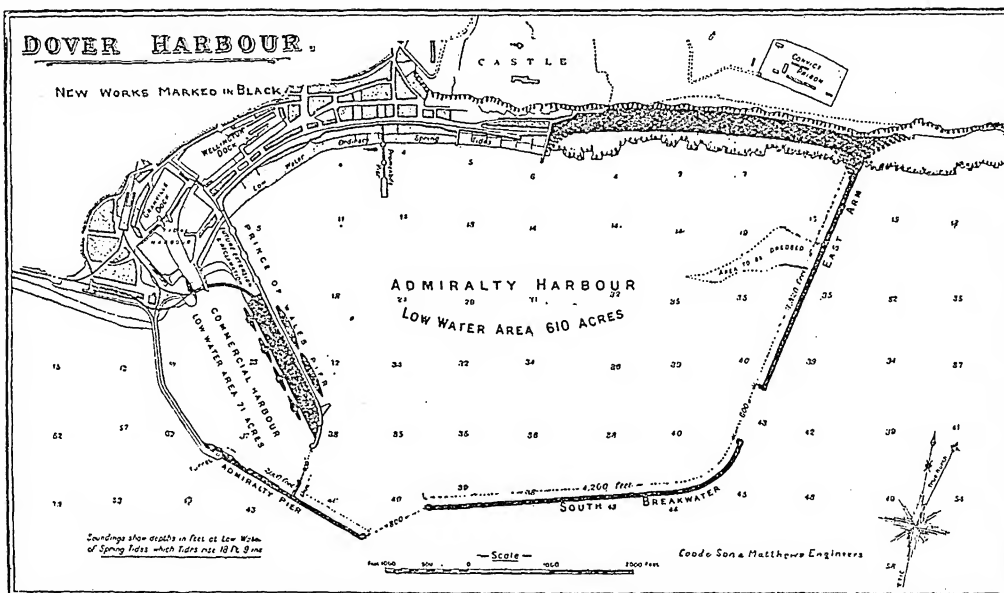
an entrance of any given size (Stevenson, pp. 120, 121). All stilling basins should have good spending beaches, with a slope of at least 3 or 4 to 1 to allow the waves to break upon them.

Breakwaters.—The designing and construction of breakwaters presuppose a knowledge of the nature and action of sea waves, because it is upon these that the principles underlying the different designs of sea works are mainly based. Here it must, however, suffice to say that waves may be broadly divided into 'waves of oscillation' and 'waves of translation'; it is the latter class with which engineers have to reckon. Breakwaters may be broadly classified into three types—(1) the mound

face is usually protected down to L.W.O.S.T. with heavy pitching. They act merely as wave-breakers, and cause the waves to expend their force on them, thus securing quiet water within. They are a suitable method of construction when there is a plentiful supply of stone in the neighbourhood, and when there is no necessity to supply shelter along the top, and where the space occupied by the very wide base which they naturally require does not prejudicially affect the harbour. (Shield, p. 198.) In the Plymouth breakwater, which is of the mound type, the slopes are faced with heavy stone pitching down to L.W.O.S.T., that on the sea side having an inclination of 1 in 5, and that on the harbour

that rubble stones weighing from five to fifty pounds had been displaced at depths of at least forty feet. In the Alderney breakwater the waves which were flung back from the face of the superstructure ploughed out the rubble mound to a depth of twenty feet. When a superstructure is placed upon a rubble mound, the top of the mound ought either to be carried well above high water, so that the waves may expend their force on the mound before coming into contact with the superstructure, or else it should be kept at least twenty feet below low water, so that there may be no danger of the superstructure being undermined.

In breakwaters of the *vertical type*, the line of the breakwater



type; (2) the mound and superstructure type; (3) the vertical type, including those having battered or slightly inclined faces.

The mound type is generally formed of large rubble, tipped into the sea and allowed to take its natural slope. Breakwaters of this type should be founded at the least from twelve to fifteen feet below the level of low water, otherwise the action of the waves will scour away the bottom. The line of a mound breakwater should be as nearly as possible square to the direction of the heaviest waves; for if it is placed obliquely to them, they tend to roll along the rubble on its face. Mound breakwaters are usually carried up to a little above high water of spring tide (H.W.O.S.T.), and the

side 1 in $1\frac{1}{2}$. Below L.W.O.S.T. the rubble has taken a slope of from 1 in 3 to 1 in 5 to a depth of ten feet below low water, and from there to the bottom the slope varies from 1 in $1\frac{1}{2}$ to 1 in $1\frac{1}{2}$. The top of the breakwater is about forty-five feet in width, and stands about five feet above H.W.O.S.T.

In the mound and superstructure type a new action comes into play. When the waves strike against the face of the superstructure they are thrown back by it, and in falling back acquire a downward force which is capable of displacing large rubble to a depth of from twenty to thirty feet (*ibid.* p. 202). Sir G. Molesworth, consulting engineer to the government of India, reported, after the failure of the Madras breakwater,

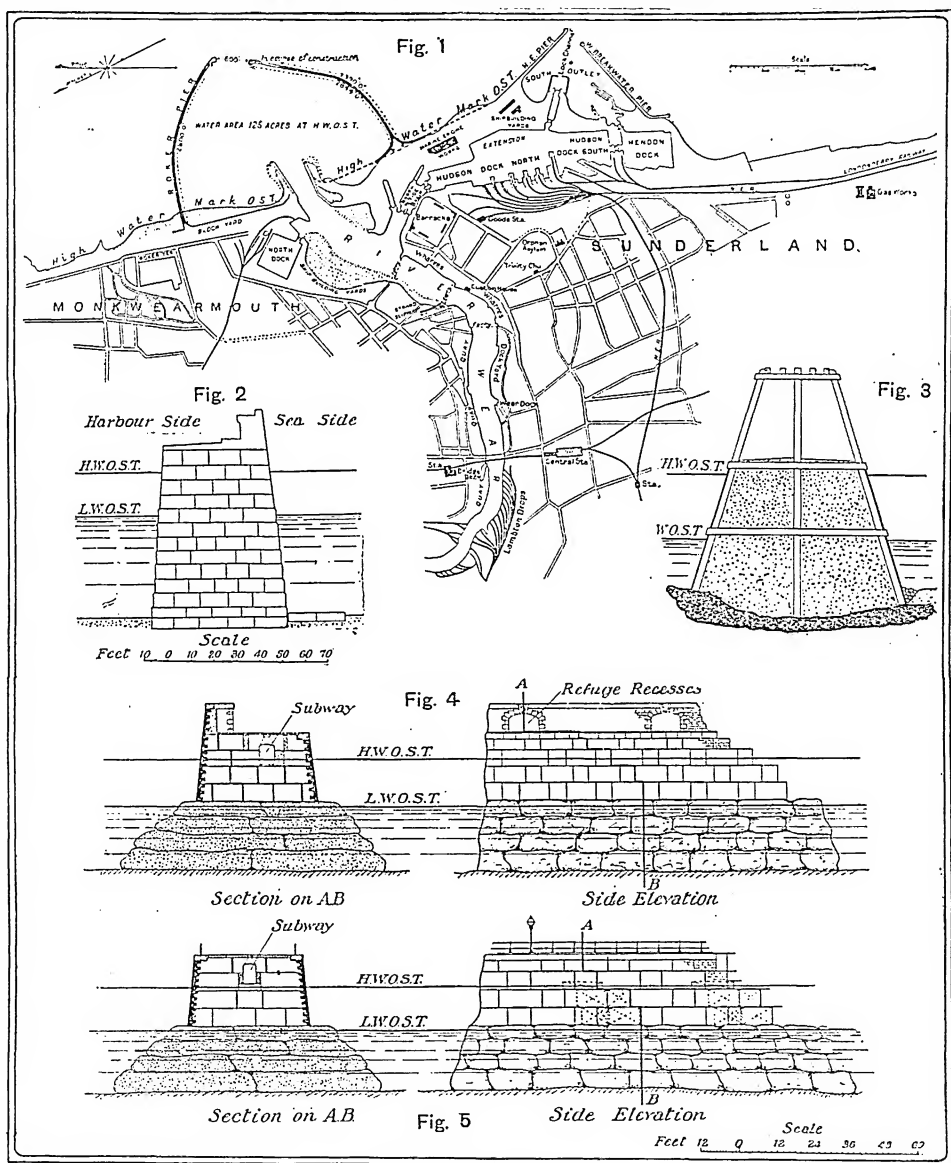
should be laid out as obliquely as possible to the direction of the heaviest waves. The force which waves exert in striking a plane surface is very difficult to estimate. The late Mr. Stevenson, by means of his marine dynamometer, obtained wave-pressures (Stevenson, p. 42) of three and a half tons per square foot at Dunbar in East Lothian, and three tons per square foot at Buckie in Banffshire. He also gives formulae for the calculation of a wave-stroke on a vertical breakwater with an inclined face (*ibid.* p. 72). When waves of translation strike a vertical breakwater, they expend their energy in throwing up vast columns of water, which rise to a height equal to twice the height of the waves. Mr. Stevenson gives the following

formula for calculating the height of waves (*ibid.* pp. 21, 22): 'Let h = height of waves in feet during a strong gale; d = length of exposure, or fetch, in nautical

—This type is only suitable where the water is shallow and the exposure to storm-waves is limited. As a general rule, it is not a type to be recommended; for, should

of the breakwater, being burst out.

(2.) *Breakwater built of Concrete in Mass, or the 'Monolithic System.'*—This method of con-



Details of Harbour Construction.

Fig. 1. Plan of Sunderland Harbour. Fig. 2. Dover Harbour: extension of Admiralty Pier (section). Fig. 3. Blyth Harbour: East Pier (section). Fig. 4. Sunderland Harbour: New South Pier (section and elevation). Fig. 5. Sunderland Harbour: Roker Pier (section and elevation).

miles; then $h = 1.5 \sqrt{d}$, and where the fetch is short $h = 1.5 \sqrt{d} + (2.5 - \sqrt[3]{d})$.

(1.) *Breakwater with Masonry Sides and Dry Rubble Hearting.*

any of the joints of the facing masonry become opened, the water tends to force its way in among the rubble hearting, and there is great danger of the top of the quayway, or the sides

struction is suitable for both large and small works. It does away with the necessity of leveling the bed of the foundations, often a costly and laborious operation, and has the further

be scratched; and quartz (7) is harder than steel. Minerals which have a hardness of (7), and cannot be scratched with a splinter of quartz or a hard steel file, are rare, and are often precious stones. For the vast majority of rock-forming minerals it is sufficient to try the effect produced on them by a good knife or a small file. It must also be remembered that minerals often differ in hardness on different faces of their crystals, and that even the same face of a crystal may have different degrees of hardness in different directions. More refined methods of testing are necessary to elicit these differences, and the 'sclerometer,' an instrument in which a small point of steel or of diamond is drawn across the surface under a definite pressure, may be used for this purpose.

Hardness of Water. See WATER.

Hardoi, chief tn. in Hardoi dist., United Provinces, India, 60 m. N.W. of Lucknow. Pop. (1901) 12,174.

Hardouin, JEAN (1646-1729), French classical scholar, who maintained the paradox that the whole of classical literature, with the exception of half a dozen authors, was spurious, being the invention of monks of the 13th century; and his scepticism extended also to all other remains of antiquity. Born at Quimper, he entered the Jesuit order about 1662, and from 1683 was librarian at the Collège Louis-le-Grand in Paris. In spite of his eccentricities, he was an accomplished scholar, and his edition (1685) of Pliny's *Natural History* has real merit. He also published *Collection des Conciles*—i.e. from the Council of Trent (12 vols. 1715).

Hard Spelter. See SPELTER.

Hardt, hill range, or rather plateau, of Germany, the N. extension of the Vosges, runs through the Bavarian Palatinate parallel with the Rhine. Its average altitude is 1,000 to 1,500 ft.; its maximum, 2,235 ft., in the Kalmit. There are excellent vineyards.

Hardwar, HURDWAR, or HARDWARA, ancient town in Saharanpur dist., United Provinces, India, on r. bk. of the Ganges, at the mouth of the gorge through which it issues from the Himalayas. Its bathing ghat and temple of Ganga-dwara are annually visited by between 200,000 and 300,000 pilgrims. Every twelfth year a peculiarly sacred festival is held. The horse fair is one of the most important in N. India. Pop. (1901) 25,597.

Hardwicke, ALBERT EDWARD PHILIP HENRY YORKE, EARL OF (1867-1904), English politician, born at the British embassy, Paris.

He was made under-secretary for India by the Marquis of Salisbury (1900), and under-secretary for war (1902) by Mr. A. J. Balfour, and again under-secretary for India from 1903 till his death.

Hardy, ALEXANDRE (c. 1560-1631), French dramatist, born in Paris. Attaching himself to a provincial theatrical company, he wrote for it about six hundred pieces, some of which held the stage for about thirty years. They were drawn from Spanish and Italian as well as from classical sources. The best of them are *Didon* (1603); *Mariamne* (1610); *Le Triomphe d'Amour* (1623). He published about forty of them in 6 vols. (1624-8).

Hardy, SIR CHARLES (1716-80), British admiral. As captain of the *Jersey*, he distinguished himself in an action with the French ship *St. Esprit*. In 1755 he was made governor of New York. Soon afterwards he saw active service in American waters, especially in connection with the Louisburg expedition. In 1759 he was second in command under Hawke in the action in Quiberon Bay. He became an admiral in 1770, and in 1771 was appointed governor of Greenwich Hospital.

Hardy, THOMAS (1840), English novelist, was born near Dorchester. In 1856 he was articled to an architect in that town, but in 1862 moved to London and worked under Sir A. Blomfield. In 1865 he began to try his hand at fiction. On the publication of his first masterpiece, *Far from the Madding Crowd*, in 1874, he finally abandoned architecture, and settled in Dorsetshire. A long series of novels, full of local colour and local character, has made Wessex as familiar a literary country as Arcadia. Two or three of his stories have been put into dramatic form and represented on the stage, and in 1904 he began the publication of a long dramatized history of the Anglo-French struggle of the Napoleonic era, entitled *The Dynasts*. Novels: *Under the Greenwood Tree* (1872); *A Pair of Blue Eyes* (1873); *Far from the Madding Crowd* (1874); *The Return of the Native* (1878); *The Trumpet-Major* (1880); *The Mayor of Casterbridge* (1886); *The Woodlanders* (1887); *Wessex Tales* (1888); *A Group of Noble Dames* (1889); *Tess of the D'Urbervilles* (1891); *Life's Little Ironies* (1894); *Jude the Obscure* (1895); *The Well-Beloved* (1897); etc. Collected novels: 'Wessex' ed. (1895, etc.). Poems: *Wessex Poems* (1898); *Poems of the Past and the Present* (1901). See monographs by Lionel Johnson, with bibliography (1894); A. Macdonell (1894); B. C. A. Windle. *The Wessex of Thomas Hardy* (1901).

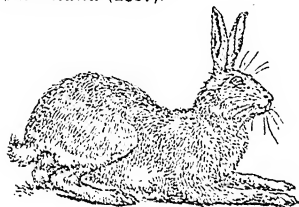
Hardy, SIR THOMAS DUFFUS (1804-78), British scholar and antiquary, born at Port Royal, Jamaica, and was appointed to a junior clerkship in the branch Record Office at the Tower of London (1819). He compiled and introduced *Monumenta Historica* (1848), and edited several *Rolls*, chiefly of the reign of King John, for the Old Record Commission. His appointment to the deputy-keepership at the New Record Office (1861) enabled him to aid in the establishment of the Historical Manuscripts Commission (1869). He also edited several volumes of the *Rolls Series* of chronicles and memorials.

Hardy, SIR THOMAS MASTERMAN (1769-1839), English vice-admiral, a native of Somersetshire; was in the *Minerva* at the time (1796) of her action with the *Sabina*, at the battle off Cape St. Vincent in 1797, and at the cutting out of the *Mutine* at Santa Cruz in the same year. He was present at the battle of the Nile (1798), was flag-captain to Nelson (1798-9), and was with him at the battle of Copenhagen in 1801. After the renewal of the war, he was again Nelson's flag-captain in the *Victory*, and his constant companion until the death of the hero, in his arms, at Trafalgar (1805). During the war of 1812-15 with America he was continuously employed. He was made a lord of the Admiralty in 1830, governor of Greenwich Hospital in 1836, and vice-admiral in 1837.

Hardy, SIR WILLIAM (1807-87), younger brother of Sir T. D. Hardy, born at Jamaica; became keeper of the records of the Duchy of Lancaster (1830). In 1868 he was transferred to the Record Office as an assistant-keeper, and in 1878 succeeded his brother as deputy-keeper. His chief public work was to calendar the Duchy records, compile and introduce the *Charters of the Duchy of Lancaster* (1845), and to edit, for the *Rolls Series* of chronicles and memorials, the first volumes of Jehan de Waurin's *Recueil des Croniques et Anchiennes Istories de la Grande Bretagne* (4 vols. 1864-84; Eng. trans. 1864-87).

Hardy, WILLIAM JOHN (1857), English record-searcher and translator, second son of Sir William Hardy, deputy-keeper of the records; born in London. He edited the *Calendar of State Papers*, William and Mary Series, for the Master of the Rolls. His works include *Handwritings of the Kings and Queens of England* (1893); *Book-Plates* (1893; 2nd ed. 1897); *Lighthouses, their History and Romance* (1895); *Documents Illustrative of English Church History* (1896); and *The Stamp Collector* (1898).

Hardyng, JOHN (1378-?1465), English chronicler; entered the household of 'Hotspur,' whose death on Shrewsbury (1403) he witnessed; he also fought at Homildon (1402), and Agincourt (1415) with Sir R. Umfreville. To prove the feudal subservience of the Scottish to the English throne, he forged those documents (some of which are still in the Record Office) that his eager quest in Scotland had failed to produce. His *Chronicle* from Brute to 1461, though valuable in the later part, is marred by its different versions being adapted to the patrons to whom it was successively addressed. See Sir Henry Ellis's preface to his ed. of the *Chronicle* (1812), and Sir F. Palgrave's *Documents and Records illustrating the History of Scotland* (1837).



Common Hare.

Hare, a name applied generally to all the members of the rodent family Leporidae, except the rabbit. The common hare (*Lepus europaeus*) occurs throughout Europe, but is absent in Iceland, Scandinavia, and N. Russia. In northern regions it tends to become white in winter. It is purely a vegetable eater, feeding on corn, grass, bark, and so forth. As is well known, the young are born fully furred, and with their eyes open; and the adult does not construct a burrow, but merely inhabits an ill-defined 'form' in the grass. Both these statements are true of all other



Mountain Hare.

hares, except the hispid hare (*L. hispidus*) of India, which is rabbit-like in its habits. From the common hare the mountain or Alpine hare (*L. timidus*) differs in the proportions of ears, hind-legs,

and tail, and in the smaller size. It is very widely distributed throughout N. Europe. For the distinctions between the hare and rabbit, see RABBIT.

Hare, AUGUSTUS JOHN CUTHBERT (1834-1903), English man of letters, born in Rome. His special study was the historical and artistic antiquities of the cities of Italy. His writings comprise *Memorials of a Quiet Life* (1872-6); *Life and Letters of Baroness Bunsen* (1879); *Walks in Rome* (1871); *Days near Rome* (1875); *Cities of Southern Italy and Sicily* (1883); *Cities of Central Italy* (1884); *Cities of Northern Italy* (1884); *Venice* (2nd ed. 1888); *Florence* (1884); *South-Eastern France* (1890); *North-Eastern France* (1890); *Story of Two Noble Lives—i.e. Countess Canning and the Marchioness of Waterford* (1893); *Life and Letters of Maria Edgeworth* (1894); *The Gurneys of Earham* (1895); *North-Western France* (1895); *Biographical Sketches* (1895); *Story of My Life* (1896-1900); *The Rivas* (1896).

Hare, JOHN (1844), English actor, born in London; obtained an engagement (1865) with the Bancrofts at the Prince of Wales Theatre, London. Here he early succeeded as Lord Parnham in *Society*, the first of his highly finished portraits of old men; he confirmed his reputation in other Robertsonian parts—Prince Perovsky in *Ours*, Sam Gerridge in *Castle*, and Beau Farintosh in *School*. In 1875 he began his career as a manager at the Court Theatre. Here Lord Kilclare in *A Quiet Rubber* was a notable addition to his character gallery. To the period of his partnership with Mr. Kendal at the St. James's (1879-88) belong his Baron Crocodile in *The Money Spinner* and Spencer Jermyn in *The Hobby Horse*. His tenancy of the Garrick (1889-95) was remarkable, among other things, for a fine production of *La Tosca*, and perhaps the most popular of his impersonations, Benjamin Goldfinch in *A Pair of Spectacles*. In 1896-7 he visited America; and at the Globe in 1899 he produced with success Mr. Pinero's *The Gay Lord Quex*. See T. E. Pemberton's *John Hare* (1895).

Hare, JULIUS CHARLES (1795-1855), English theologian, born at Valdarno, near Vicenza, Italy. He became rector of the family living at Hurstmonceaux in Sussex (1832), and archdeacon of Lewes (1840). The friend of Landor, F. Maurice, John Sterling, and Bunsen, he was a leader of the Broad Church party. His strong sense of justice led to his issuing a long series of vindications, beginning with Niebuhr (1829), whom he defended against a charge of scepticism, on the

publication of his joint-translation of Niebuhr's *History of Rome* (1828-32), and including Coleridge and Luther (1855). He published *Guesses at Truth*, written with his brother Augustus (1827); *The Victory of Faith* (1840)—sermons; and *Mission of the Comforter* (1846). See A. J. C. Hare's *Memorials of a Quiet Life* (1872-6).

Hare, WILLIAM. See BURKE, WILLIAM.

Hare and Hounds was until 1877 a schoolboy recreation. Since that date it has developed into an organized sport, with a recognized code of rules, and many clubs for cross-country running. The best known clubs are the Thames Hare and Hounds (the original), Hampton Court Hare and Hounds, Polytechnic, Ranelagh, Finchley, Epsom, Spartan, Moseley, Blackheath, S. London Harriers, and Essex Beagles. The hares may run as they like, or with a pacemaker to regulate the speed. The hounds may start together or in packs, when the hares have had their 'law'—generally 15 minutes. The man with the shortest time is the winner. The event of the year is the national cross-country championship, held alternately in the north, south, and midlands of England.



Harebell.

1, Flower, corolla removed; 2, ovary, section.

Harebell, the popular name of the beautiful, slender-stemmed *Campanula rotundifolia*, whose solitary little drooping pale-blue

flowers are borne on the finest and most graceful of flower-stalks. It flowers in late summer. There are several varieties found wild in Britain, including a white one, and a large-flowered one known as *C. r. speciosa*. The leaves which appear in summer, when the plant is in flower, are long and narrow; the specific name refers to the rounded leaves borne in winter and spring. The name harebell or hairbell is also sometimes applied to the wild hyacinth or 'bluebells' of the May hedgerows.

Hareld, or **LONG-TAILED DUCK** (*Harelda glacialis*), an Arctic bird, characterized by the great elongation of the tail feathers in the male. Its habitat is the far north of both hemispheres; but it occurs as a winter visitor to Britain. The note of the drake is loud and musical, and gives the bird its popular name of 'calloo' in the Shetlands.

Harelip, a congenital deformity, due to a developmental deficiency, which results in a vertical cleft of the upper lip, on one or both sides of the middle line. It is often accompanied by cleft palate. Treatment consists in paring the edges of the cleft or clefts, and bringing the raw edges together by sutures or harelip pins. Should the child be otherwise healthy, the operation should be performed two or three months after birth. When cleft palate also is present, the harelip should be treated at the usual time, and the necessary operation upon the palate should be deferred until the child is four or five years old.

Harem, the name given in Turkey, Egypt, Syria, and other countries to that secluded part of a Mohammedan dwelling which is reserved exclusively for the female members of the household. The word is also used to signify those who live in the harem. As an institution the harem existed among the ancient Babylonians and Persians, and seems to have appeared, in one form or another, among all those races which, while practising polygamy, have arrived at any considerable degree of civilization. It has attained its greatest development, however, among Mohammedan races. By the Koran only four wives are allowed to a Mussulman, but there is no limit to the number of concubines. Each wife has a separate suite of apartments, and a garden, and her own body of servants. The inmates of the harem may not be seen by any man except the husband and their own immediate relatives. The majority of men among the Turks and the Persians have only one wife, owing to the expense of maintaining more

than one establishment. Lady Mary Wortley Montagu's account of the harems of Constantinople appeared in 1836. The harems of Cairo and Damascus were described by Harriet Martineau in 1847. See also Mrs. Harvey's *Turkish Harems and Circassian Homes* (1871).

Hares, N. American aborigines, one of the main branches of the Chippewayans, who are scattered in small groups along the banks of the Mackenzie, Anderson, and Macfarlane rivers, between the Great Bear Lake and the Eskimo domain. They are employed as trappers and voyageurs or assistants about the stations of the Hudson's Bay Company; and, like most other Chippewayans, are described as a gentle, inoffensive people, though somewhat indolent and quarrelsome amongst themselves.

Harfleur, former harbour, dep. Seine-Inférieure, France, on estuary of Seine, 5 m. S.E. of Le Havre. There are distilleries, potteries, and chemical works. During the Hundred Years' war Harfleur was the chief harbour on the French coast of the Channel. In 1415 it was taken by the English under Henry V. It was invested in the following year by the French, who were defeated by a fleet under John, Duke of Bedford, and others. The English lost the town on Nov. 4, 1435. A small stream silted up the harbour, and Le Havre took its place. Pop. (1901) 2,683.

Hargraves, EDMUND HAMMOND (1816-91), discoverer of the Australian gold fields, was born at Gosport, Hampshire; became an Australian sheep-farmer, and (Feb. 12, 1851) discovered gold at Lewis Ponds Creek in the Blue Mountains, N.S.W. Appointed commissioner of crown lands, he was granted £10,000, and was subsequently pensioned. He wrote *Australia and its Gold-fields* (1855).

Hargreaves, JAMES (d. 1778), inventor of the spinning-jenny, was a handloom weaver near Blackburn, when he invented, about 1764, the spinning-jenny, by which children were enabled to do eight times as much as had formerly been done by adults. For thus upsetting old methods he was mobbed by his fellow-workmen (1768). Having gone to Nottingham, where he took out a patent (1770)—which, however, was frequently infringed—he had till his death a partnership in a small cotton mill.

Haricot, the name commonly applied to the dried seeds of the French bean or kidney bean. They are extensively eaten in France. They contain twenty-three per cent. of casein and fifty-two per cent. of starch. See BEAN.

Häring, GEORG WILHELM HEINRICH (1798-1871), German novelist, born at Breslau, wrote under the name of 'Willibald Alexis.' His first success was won in 1823; with a historical romance, *Walladmor*, purporting to be an unpublished work of Sir Walter Scott. It was translated into English by De Quincey (1824), and praised by Sir Walter. The same pretence was kept up in two more novels, *Die Gedächtnen* (1825) and *Schloss Avalon* (1827), but then dropped. Chief subsequent novels: *Cubanis* (1832); *Der Falsche Woldemar* (1842); *Hans Jürgen und Hans Jochem*, probably his best work (1846); and *Der Wärrwolf* (1848). Häring's *Gesammelte Werke*, in 20 vols., were published at Berlin (1874); and his *Vaterländischen Romane*, in 8 vols. (1884).

Haringvliet, Netherlands. See HOLLANDSCH DIEP.

Hariri, ABU MOHAMMED AL KASIM IBN ALI, AL- (1054-1121), Arabic author, surnamed AL-Hariri = 'the silk merchant,' was born at Basrah, on the Shat-el-Arab, and his life was devoted to literary pursuits and studies. The most famous of his compositions was *Maḳāmāt*, a collection of tales in rhyme, which are unrivalled in Arabic literature for brilliancy of imagination and wit. This book is regarded in the East as second only to the Koran. It has been translated into German by Rückert (1826); and into English by Preston (1850), and by Cheney (1867). Text edition by Reimund and Derenbourg (1847-53), and by Steingass (1896). Hariri also wrote works on grammar.

Harirud. See HERRUD.

Harlamov, ALEXIS (1844), Russian painter, born at Saratov. He has painted the portraits of several distinguished Russians, including the Czar Alexander, and excels at depicting children. He has often exhibited at the Salon in Paris, where he went to live about 1870.

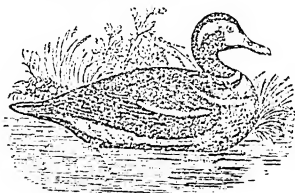
Harlech, small tn., Merionethshire, Wales, on coast, 10 m. N. of Barmouth. The 14th-century castle held out against the Yorkists, but in 1468 was forced to surrender. This siege is said to have given rise to the Welsh national air, *Men of Harlech*. There are quarries in the vicinity, and good bathing sands.

Harleian Manuscripts, a collection made by Robert Harley, Earl of Oxford (1661-1724), and by Edward (1689-1741), his son. It consists of 8,000 MSS.—many quite unique and extremely valuable—50,000 printed books, and 400,000 pamphlets. The collection is rich in illuminated MSS. relating to civil and religious history, copies of the classics—containing the earliest known copy of the *Odyssey*—and

of early English poetry. A large part of the collection was purchased by the British government for £10,000 in 1753, and is now in the British Museum.

The Harleian Society, instituted in 1869 for the publication of inedited MSS. relating to genealogy, family history, and heraldry, issues annually accounts of the heraldic visitation of counties.

Harlequin, a survival from Greek and Roman comedy. The mediæval Italian *arlecchino* was equivalent to the English clown. The harlequinade is—or rather was, for it is now practically obsolete, at any rate in London—a pantomime performance acted in dumb show. The business of harlequin is to protect columbine against the intrigues of pantaloons and clown. See Broadbent's *Hist. of Pantomime* (1901).



Harlequin Duck.

Harlequin Duck (*Cosmonetta histrionica*), a handsome species, which inhabits the Arctic regions both of the Old and New World, and strays occasionally into Britain. In Iceland it is fairly abundant, and has been described in winter from various parts of Europe and America. The drake has the head finely marked with black and white, while the female is of a nearly uniform brown colour above.

Harless, GOTTLIEB CHRISTOPH ADOLF VON (1806–79), German theologian and champion of strict Lutheran orthodoxy, born at Nuremberg; was professor at Erlangen from 1836, and at Leipzig from 1845, and in 1852 became president of the Protestant consistory at Munich. His best known books are *Die Christliche Ethik* (1842; Eng. trans. 1838); *Theologische Encyclopädie und Methodologie* (1837); also an autobiography, *Bruchstücke aus dem Leben eines Süddeutschen Theologen* (1872–4). See *Life* by Langsdorff (1898).

Harley, ROBERT. See OXFORD, EARL OF.

Harlingen, seapt. tn., Netherlands, on w. coast of prov. Friesland, 16 m. by rail w. of Leeuwarden. It possesses a new harbour, built in 1870–7, and exports butter and cattle. The town suffered from sea-floods in 1134 and 1566. Pop. (1900) 10,267.

Harman, SIR JOHN (d. 1673), British admiral, was in command of the *Welcome* in the first Dutch war (1653); and in the battle off Lowestoft, in 1665, he was captain under Penn to the Duke of York. In June of the following year he was severely wounded at the second battle of the North Foreland. In 1667 he obtained a decisive victory over the French and Dutch at Martinique, seizing Cayenne and Surinam. In the third Dutch war Harman was present at the battle of Sole Bay in 1672, and in the actions off Schooneveld (mouth of W. Scheldt) in 1673.

Harmattan, the hot east wind blowing from the interior of Guinea to the Atlantic Ocean. Coming off the desert, it is laden with clouds of reddish dust, which has been known to cover the sails and decks of ships to a distance of seven hundred miles from shore. It blows during the months of December, January, and February, continuing from one to fifteen days. In winter, when the trade winds attain their most southerly direction, it is felt as far south as Sierra Leone and Cape Palmas.

Harmodius, an Athenian. Hipparchus, son of Pisistratus, and apparently joint-ruler of Athens with his brother Hippias, insulted the sister of Harmodius. In revenge, Harmodius and Aristogeiton formed a conspiracy to murder the tyrants on the day of the Panathenaic festival; but being too precipitate, they killed Hipparchus only. Hippias then arrested those whom he suspected. Harmodius was killed on the spot by the guards of Hipparchus; Aristogeiton was arrested and put to death (514 B.C.). Though Hippias ruled for four years longer, the Athenians, in a famous drinking song, praised the slayers of Hipparchus as the liberators of Athens. There is a dialogue *Hipparchus* ascribed to Plato.

Harmonica (*armonica* = 'musical glasses'), a musical instrument in which sounds are produced by the percussion or friction of the moistened fingers on cups or tubes of glass or metal. Now merely a toy, the instrument, in various forms, was formerly of artistic importance. Gluck and Dussek performed upon it, and compositions were written for it by Mozart and Beethoven. Its inventor is unknown, but forms of it were in use early in the 17th century.

Harmonic Motion, the general name given to a reciprocating motion like that of a piston or a pendulum. The particular kind known as simple harmonic motion is defined geometrically as the projection of uniform circular

motion on a diameter. Dynamically it is the straight-line motion executed by a particle acted upon by a force directed towards a fixed point and varying as the distance from that point. It is the basis of the whole theory of vibrations and of waves. Many periodical oscillations, such as

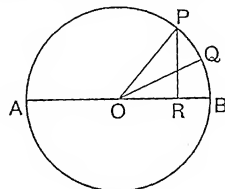


FIG. 1.

the vibrations of a string in producing a musical note, can be analyzed into simple harmonic disturbances, and investigated by the method of harmonic motion. Simple harmonic motion is the resolved part of a uniform circular motion parallel to a diameter. If P (Fig. 1) moves uniformly round the circle APB, R, the foot of the perpendicular from P on the diameter AOB, has a simple harmonic motion. If x be distance of R from the centre O at any time t , $x = a \cos(\omega t + \beta)$, a being the amplitude of the movement—i.e. OB, β the epoch, or the angular distance BOQ of the point Q from which the motion is reckoned, and ω the angular velocity of P. The angle BOP, marking the position of P, is called the phase. The first and second differentials of x with respect to t give the velocity and acceleration of R. In many self-registering instruments the indicator moves over the surface of a slip of paper, which has a motion at right angles to its own, so that the path of R is drawn out into an undulating curve, known as the curve of sines. Such is the form produced by the simplest vibra-

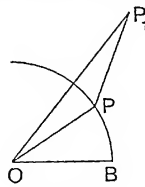


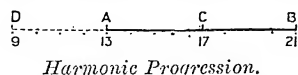
FIG. 2.

tion of a string, and by simple ripples on a water surface. Two or more simple harmonic motions in the same line may be superposed, and if they have the same period they will be equivalent to a single motion of the same period. For if P₁ (Fig. 2) revolve round P with the same velocity as P round

o, the angle OPP_1 will remain constant, and the triangle OPP_1 will retain its form, so that P_1 will revolve round O in the same period. If the phases be alike—i.e. if OPP_1 equal two right angles—the resultant amplitude is the sum of the component amplitudes; and if $OPP_1 = 0$ —i.e. if the phases differ by two right angles—it is the difference of the components. If the periods be unequal, the triangle OPP_1 will continually change its form, and will not return to the same form until one of the points P and P_1 has made exactly one more revolution than the other, or after a time $2\pi/(\omega - \omega_1)$. This combination of motions is illustrated by the tides (see TIDES). Harmonic motions in different directions may also be combined. We may, for example, reproduce the original circular motion, in terms of which harmonic motion was designed, by combining with the given harmonic motion another of equal amplitude and period at right angles to it. Generally two harmonic motions of the same period, but of different amplitudes, directions, and phases, combine to form elliptic motion, the extreme cases being straight-line motion and circular motion. If the periods are nearly but not quite equal, the path is approximately elliptical, but continually changes through all the forms. When the periods are distinctly unequal, the paths must be traced by points, except when they are in a simple ratio. For instance, when the one period is double the other, the path continually changes from a figure 8 to a part of a parabola and back again.

Harmonicon, the name of two musical instruments, the one a simple toy, composed of a number of free reeds contained in a box, and arranged in such a way that two variations of sound are produced, one by inspiration and the other by respiration. The second harmonicon is of a more elaborate description, and that principally associated with merry-go-rounds, consisting of a barrel organ, with ordinary and extraordinary pipes, which give the full effect of a large military band.

Harmonic Progression is the name given to a series whose successive terms are the reciprocals of an arithmetical progression. Thus 9, 13, 17, 21, 25, etc., form an arithmetical progression with



difference 4; and the fractions $\frac{1}{9}, \frac{1}{13}, \frac{1}{17}, \frac{1}{21}$, etc., form a H.P. When three numbers are in H.P.,

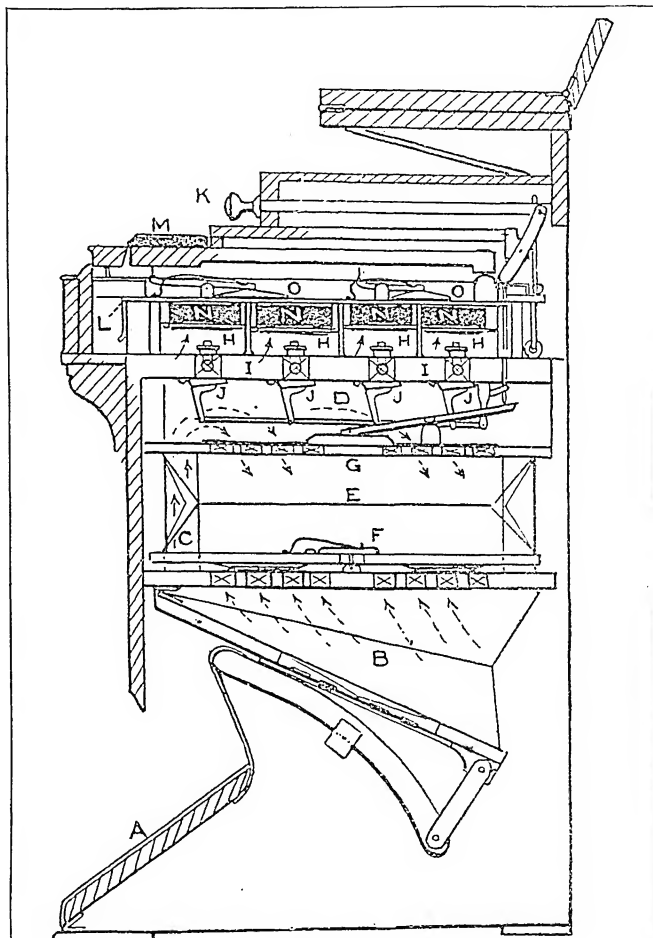
the middle number is called the 'harmonic mean' between the other two. Thus $\frac{1}{17}$ is the harmonic mean of $\frac{1}{9}$ and $\frac{1}{21}$. Let x and y be two numbers. The arithmetic mean is $\frac{1}{2}(x + y)$, the geometric mean is \sqrt{xy} , and the harmonic mean is

$$\frac{2xy}{x + y}.$$

Hence the product of

monic progression. D must lie in the line produced either beyond A or beyond B.

Harmonium, a modern keyboard musical instrument, patented in its present form by Debain, Paris, in 1840. Its sounds are produced by what are termed vibrators, constructed upon the free-reed principle, and acted upon by a strong current of air. The vibrator consists of a brass



Harmonium.

A, Treadle; B, bellows; C, wind trunk; D, wind chest; E, reservoir; F, discharge pallet, acting as a safety valve; G, expression hole, closed by expression stop, to send the air direct to tongues or vibrators H; I, bellows board, covering air apparatus; J, valves admitting air to the different rows of vibrators, opened by stops K; L, sound board or 'pan' with channels X; O, pallet hole for escape of air from vibrators. (The arrows show the course of the air.)

the arithmetic mean and the harmonic mean is the square of the geometric mean. A straight line AB is said to be divided harmonically when to any point C between A and B a second point D is found so that DA, DC, DB form a har-

plate containing an oblong aperture, at one end of which is fixed a thin strip of finely-tempered brass made a little less than the size of the opening, so that it may vibrate freely without coming in contact with the surface of the

plate or the edges of the aperture. (For free reed and beating reed, see ORGAN.) The tongues are slightly curved or twisted in various ways to produce certain kinds of tone. The vibrators are set in rows over an air reservoir, fed by bellows which are worked by the feet of the player. From one to four—occasionally more—sets of vibrators are used according to the size of the instrument. The sets are divided into bass and treble, the latter beginning at F on the first space of the treble stave. The compass is five octaves, from C below the bass stave to the second C above the treble stave, and the notes of the keyboard are similar in arrangement to those of the piano. A row of stops, above and parallel with the keyboard, controls the mechanism, by means of which the performer brings into action any set or combination of vibrators. Among de-

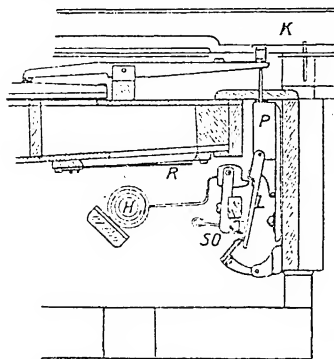


Diagram of Percussion Action.

K, key; P, plunger; L, lever; H, hammer; SO, set off; R, reed.

vices to produce certain effects are the 'expression stop,' invented by Alexandre de Paris, and the 'percussion stop,' invented by Martin. The action of the former, by closing the valves of the air reservoir, makes the degree of wind pressure dependent upon the management of the bellows. The percussion stop causes a little hammer to strike the reed simultaneously with the admission of air to it, and the consequent instant vibration of the tongue ensures clearness of attack. Some large instruments contain two manuals besides pedal attachments. The American Organ, introduced by Mason and Hamlin, Boston, about 1860, closely resembles the harmonium in general construction. Its chief points of difference consist in having the action of the bellows reversed, so that the wind is sucked or drawn inwards, and in having the tongues smaller, more

twisted and curved, also less in proportion to their apertures than in the harmonium. These alterations produce a softer, more mellow quality of tone peculiarly suitable for sacred music; but the American organ lacks the variety of tone and power of expression possessed by the harmonium.

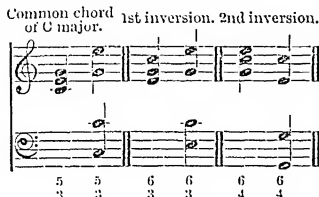
Harmony, in music. This important branch of the art consists of uniting related musical sounds in conjunctive groups, termed chords, the formation and manner of progression of which are governed by more or less fixed laws. The earliest idea of harmony seems to have been to add a sustained bass note of unvarying pitch to act as an accompaniment to a melody. Forms of this method survive in the sustained drones of the bagpipe, in the percussion bass of a fife and drum band, and in the device of pedal-point. Although the ancient Greeks seem to have had considerable theoretical knowledge of the subject, there is no evidence that any form of harmony other than that of the drone bass was in use before the 10th century, when the addition of a single part to a *canto fermo* is first described; fourths, fifths, and octaves were the combinations most frequently employed. About a century later this method was succeeded by a form termed 'discantus,' in which two distinct melodies were so arranged that, when sung together, they produced tolerable two-part harmony. As time went on other combinations and devices were introduced, and harmony was studied systematically; chords were classified, and rules for their progression formulated. About the close of the 14th century, discords, passing notes, suspensions, accidentals, inversions, and chromatic passages were in use; four-part writing had been introduced, and descant had changed to counterpoint, under which name it soon became a highly intricate form of musical composition. Composers were, however, fettered by the limitations of the ecclesiastical scales of the period, which still retained many of the peculiarities of their ancient Greek prototypes. Nevertheless, before the end of the 16th century Josquin, Lassus, Palestrina, and others had shown the great results which could be achieved by skilful manipulation of a limited number of chordal combinations. Constant efforts were made to break the bonds of convention, but the most startling innovation was that of Monteverde, who in 1600 introduced the use of unprepared dominant sevenths and other discords. This new feature, while greatly augmenting the dramatic resources

of the musician, also paved the way for subsequent discoveries, which eventually placed the study of harmony upon an entirely new basis. The principles of key and chord relationship were gradually analyzed and understood, and, as a natural sequence, the practice of modulation became general. Under the new system the creation of chordal combinations was no longer regarded chiefly as the result of sounding separate melodies conjointly; but it was recognized that each chord possesses a distinctive individuality, and that its construction, also the manner in which chord succeeds chord, must be regulated by the exigencies of chord or key relationship and definite tonality. Concurrently with these developments in harmony the old ecclesiastical scales became modified into their modern forms. At a somewhat later period the introduction of temperament, by means of which all keys are made theoretically equal, gave unlimited scope to modulation, and made possible the valuable device of enharmonic changes. In the beginning of the 18th century J. S. Bach, by uniting the old systems and the new, as exemplified in his masterly development of every form of composition, may be said to have set the chief corner-stone in the structure of modern harmony.

Towards the close of the 17th century, Rameau, by theorizing upon the phenomenon that what is termed an individual tone is in reality compounded of various sounds of different pitch generated by the fundamental, and Tartini, who discovered that certain notes when sounded together produce a distinct third sound, separately endeavoured to show that chordal combinations are governed by the principles of inherent tonal relationship. Helmholtz, in his *Sensations of Tone* (1863), by uniting the theories of Rameau and Tartini, analyzing and showing their relation to each other, and by including and demonstrating the important fact that *beats* determine degrees of consonance or dissonance, constructed a theory which has been generally accepted as proving that the modern system of harmony is founded upon a harmonic basis.

A common chord or triad in its root position consists of a fundamental note, its major or minor third, according as the chord is a major or a minor common chord, and its perfect fifth above. The intervals may be simple or compound—i.e. within an octave or beyond it—and the notes may be duplicated without altering the designation of the chord. If the root note is altered from its

original position, the chord is said to be inverted, as in—



In figuring chords the notes are always counted upwards from the lowest: for example, the root position of the common chord is called a 5 chord, because it consists of a third and a fifth above the lowest or first note. The common chord is consonant; but if successions of consonant chords only were used, it would be impossible to give expression to any great variety of emotions; therefore, to supply the dramatic element in music, dissonant chords are introduced. Among these the dominant seventh (formed by adding a minor third to a major common chord on the dominant) and the chord of the ninth (a major or minor third added to the chord of the seventh) are of most importance. The number of designated chords is not large; but by means of their several forms, in conjunction with the aids of modulation, enharmonic changes, and other devices, it is possible to vary chordal combinations to a practically unlimited extent. The art of harmony is still progressive, and the assimilation of new ideas necessitates constant modification of hitherto accepted theories. (See also MUSIC.) Among well-known works on harmony are those by Albrechtsberger (1834), Richter (1887), Sir George Macfarren (1892), Sir Frederick Ouseley (1866), Dr. Ebenezer Prout (1889), and Sir John Stainer (1877).

Harmony, PRE-ESTABLISHED, the term used by Leibniz to designate the relation of correspondence that obtained between the monads or ultimate psychical units of his metaphysical system. Denying interaction between the monads, but asserting a complete correspondence between their states, so that each mirrored the whole universe, Leibniz described their relation in theological language as a 'harmony pre-established by a contrivance of the divine foresight.' See Latta's translation of the *Monadology* (1898), pp. 39 ff. (Introd.); and for the famous illustration of the clocks, pp. 331 ff.

Harmony of the Gospels. See GOSPELS, HARMONY OF THE.

Harms, CLAUDIUS (1778-1855), German theologian, born in Ditmarsch (Schleswig-Holstein);

held various parochial charges and ecclesiastical dignities at Kiel from 1816 to 1849, exercising great influence over the students of the university. His memorial work in celebration of the tercentenary of the reformation, *Das sind die 95 Thesen oder Streitsätze Luthers* (1817), was widely read in Germany. He also published three volumes of *Pastoraltheologie* (3rd ed. 1878). See his *Autobiography* (latest ed. 1888).

Harmsworth, SIR ALFRED CHARLES. See NORTHCLIFFE, LORD.

Harnack, ADOLF (1851), German church historian, was born at Dorpat. In 1874 he became lecturer in church history at Leipzig, and two years later professor. In 1879 he was called to Giessen, in 1886 was transferred to Marburg, and in 1889 to Berlin, where his lectures attracted students from all countries. His theological standpoint shows the influence of Ritschl: he regards the development of dogma as a deleterious process of interfusion of Greek forms of thought with the gospel teaching, culminating in the organized theology of Roman Catholicism, and partially dissolved at the reformation. Professor Harnack's industry, erudition, and historical insight have already passed into a proverb. His *Lehrbuch der Dogmengeschichte* (1886-90; 3rd ed. 1894-7), trans. as the *History of Dogma* (1895-1900), is an epoch-making work; his *Grundriss der Dogmengeschichte* (3rd ed. 1898; trans. 1893) is a concise summary. Other works of importance are *Texte und Untersuchungen*, with Von Gebhardt (1882-94); *Martin Luther* (1883; 3rd ed. 1901); *Das Mönchtum* (1881; 6th ed. 1903; Eng. trans., *Monasticism*, new ed. 1903); *Geschichte* (1893) and *Chronologie der Altchristlichen Literatur bis Eusebius* (1897-1904); *Patrum Apostolicorum Opera*, with Zahn and Von Gebhardt (1876-8); *Das Wesen des Christentums* (1900; Eng. trans., *What is Christianity*, 1902); *Das Apostolische Glaubensbekenntnis* (1892; 27th ed. 1897; Eng. trans., *The Apostles' Creed*, 1901); *Die Mission und Ausbreitung des Christentums* (1902; 2nd ed. 1906; Eng. trans. 1904); *Reden und Aufsätze* (1903). He has written many smaller volumes, and contributed largely to religious magazines.

Haro, city, prov. Logroño, Spain, on r. bk. of riv. Ebro, 22 m. W.N.W. of Logroño; is the centre of the Rioja wine district. Pop. (1900) 7,914.

Harocris, an Egyptian deity, identified with Horus.

Harold, called HAREFOOT (d. 1040), king of the English; became a candidate for the English

throne on the death (1035) of his father Canute. Opposed, however, by the supporters of his step-brother, Hardicanute, at a meeting of the Witan at Oxford, by a compromise he was chosen to rule north of the Thames. He was chosen king of all England (1037).

Harold (?1022-1066), king of the English, second son of Earl Godwin, shared in his father's banishment (1051) and restoration, and on Godwin's death (1053) became Earl of Wessex. As second in the kingdom, especially after the death of Edward the Atheling, he was looked on as the possible successor to Edward the Confessor. On his visit to William of Normandy he was compelled to swear to uphold the duke's claim to the English throne (?1064). In 1066 he was nominated by the English king as his successor, and on the king's death was elected by the nobles. Thereupon William of Normandy invaded England. Harold, first defeating Harold of Norway and his own brother Tostig at Stamford Bridge in Yorkshire, marched against William, and at the battle of Senlac, seven miles from Hastings, was overthrown and slain. See Freeman's *Norman Conquest* (3rd ed. 1877), vols. ii. and iii., and J. R. Green's *Conquest of England* (1883).

Harold, four kings of Norway, of whom only two call for notice. **HAROLD I.** (king, 863-933), son of Halfdan the Black, united Norway into one kingdom. He had sworn never to have his hair clipped till he had conquered Norway, whence he was known as *Haarfagr* ('Fair-hair'). By his victory at Hafrsfjord (872) he destroyed the provincial autonomy of Norway, but in his last years he divided the realm among his sons (930).—**HAROLD III., Hardraade** ('Hard in Counsel'), half-brother of St. Olaf. After the defeat of the latter at Stiklestad (1030) by the heathen party, Harold took refuge in Novgorod, and then for some years was captain of the Varangian guards at Byzantium, winning many brilliant victories over the Saracens in Italy and Sicily. He returned about 1045 to Norway, and after the death of his nephew Magnus the Good (1047) succeeded to the crown of the whole kingdom. His attempt to subdue Denmark failed, and he fell fighting against Harold of England at Stamford Bridge (1066). See Boyesen's *History of Norway*.

Harold, called BLUE-TOOTH, king of Denmark (936-986). In 976 he offered to be baptized in order to conciliate the Emperor Otto, with whom he was at war, and, as first Christian king of Denmark, made Odense a bishopric, and built a church at Roskilde.

Haromszek, co. of S.E. Hungary; fills the inner angle of the Carpathians, and yields agricultural products. Area, 1,373 sq. m. Chief town, Sepsi-Szent-György. Pop. (1900) 136,797.

Haroun al-Raschid, or **HARUN AR-RASHID** (763 or 766-809), fifth of the Abbassid caliphs of Bagdad, was born at Ray (Rhagae), near Teheran, and ascended the throne when twenty-two years of age. To the Western mind he figures chiefly as the hero of the *Arabian Nights*, and as the maintainer of a magnificent court, where he gathered around him a brilliant company of poets and scholars. His fame was carried

used in Scotland and Ireland centuries before the introduction of the bagpipe; but, like the Welsh harp, 'telyn'—a larger form of the instrument—they are now practically obsolete. In all its forms the harp has always been played by plucking the strings with the fingers. The sound-board is of pine, but maple and beech are generally used for the other parts constructed of wood. The strings are made of gut, with the exception of the lowest eight, which are of silk or wire, overspun with wire. Formerly harps were tuned to the diatonic scale of the particular key in which music was to be

tone. The capabilities of the instrument—at this time tuned in E flat—were thus greatly increased. In 1810, Sebastian Erard, by working upon an entirely new principle and making certain structural alterations, succeeded in producing the perfect form of double-action, which is now an essential feature in all modern harps. Erard's invention is worked by seven pedals, each of which raises a string and all its octaves half a tone at the first action, and another semitone at the second. The harp is now tuned in C flat, with a compass of six and a half octaves. See R. B. Armstrong's *Musical Instruments: Irish and Highland Harps* (1905).

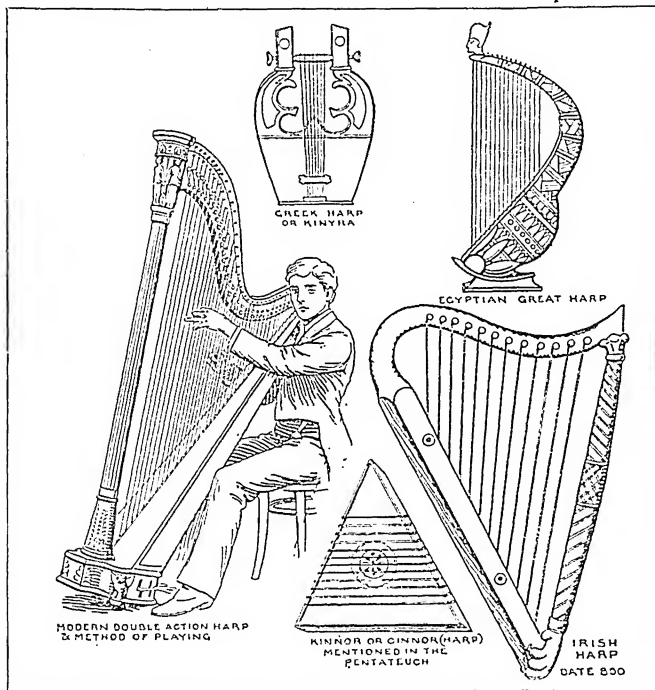
Harpagus, a general of the Persian monarch Cyrus the Great, who about 540 B.C. conquered the Asiatic Greeks, the Carians and Lycians.

Harpalus, a Macedonian, and superintendent of the treasury under Alexander the Great. While the king was absent on his Indian expedition Harpalus remained at Babylon, and was guilty of such excesses that he did not dare to await Alexander's return, but fled to Greece with a huge treasure of 5,000 talents (£1,115,000), and took refuge at Athens. The Athenians, however, resolved to confine him until Antipater sent for him; but he escaped to Tænaron, where he was murdered by one of his own officers (324 B.C.). Demosthenes was found guilty of misappropriating some of Harpalus's money, and was heavily fined, and exiled from Athens.

Harpe, **JEAN FRANÇOIS DE LA**. See **LA HARPE**.

Harpden, par., vil., and urban dist., Hertfordshire, England, 5 m. S.E. of Luton. At Rothamsted, in 1843, Sir John Bennet Lawes began his systematic experiments in agriculture. In 1889 he made over to trustees £100,000 for the continuance of the work. Harpenden is chiefly a residential place. Pop. (1901) 4,725.

Harper and Brothers, New York printing and publishing firm, started in 1817 as J. and J. Harper by four brothers—viz. James (1795-1869), John (1797-1875), Joseph Wesley (1801-70), Fletcher (1806-77), sons of Joseph Harper, farmer, of Newtown, Long Island. They issued about two hundred works before changing the name in 1833 to Harper and Brothers. In December 1853 their establishment was burned down, but was rebuilt. The firm issues *Harper's Magazine* (founded 1850), *Harper's Weekly* (1857), *Harper's Bazaar* (of fashions, 1857), and *Harper's Young People*, now *Harper's Round Table* (1881). The firm was reorganized in 1899 as a limited liability company.



Various Forms of Harp.

to Europe by an embassy which Charlemagne sent to him. In reality, however, Haroun was not only ruthless and revengeful, but was also ungrateful; for, out of sheer jealousy, he murdered Ja'far the Barmecide and all his family, though it was to Ja'far's father that he virtually owed his throne. He waged successful war against the Byzantine Empress Irene and her successor Nicephorus. His empire extended from Tunis to Transoxiana. See *Life* by E. H. Palmer (1880).

Harp, a beautiful musical stringed instrument of very ancient, probably Egyptian, origin. Two small forms of harp, 'clarsach' and 'clairseach,' were much

performed, and to produce an accidental a string had to be pressed by the finger and shortened sufficiently to make it give the sharp of its open sound or the flat of the next higher string. Subsequently metal crooks were introduced to serve this purpose; but each crook acted only upon a single string, and they also had to be worked by hand. Chromatic harps, having thirteen strings to each octave, were tried, but the system was found to be impracticable. About 1720 a Bavarian named Hochbrucker devised the first pedal mechanism applied to the harp, so that by means of seven pedals each string and its octaves could be raised a semi-

Harper, WILLIAM RAINY (1856-1906), American scholar, was born at New Concord, Ohio. In 1875-6 he was principal of the Masonic College at Macon in Tennessee. He subsequently held the appointments of principal of Denison University, Ohio (1879-80); professor of Hebrew in the Baptist Union Theological Seminary, Chicago (1879-86); principal of Chautauqua College (1885-91); professor of Semitic languages at Yale (1886-91); Woolsey professor of Biblical literature at Yale (1889-91); and president of the University of Chicago (1891-1906). Among his published works are *Elements of Hebrew* (1882); *Hebrew Syntax* (1882); *Hebrew Vocabularies* (5th ed. 1890); *An Introductory New Testament; Greek Method; Inductive Latin Primer* (1898); *Structure of Text of Book of Amos* (1904); *Inductive Studies in English; Inductive Greek Primer*; and annotated editions of Virgil, Caesar, Xenophon, and Cicero.

Harper's Ferry, vil., Jefferson co., W. Virginia, U.S.A., on Potomac R., at its union with the Shenandoah, 62 m. w. of Baltimore. On Oct. 16, 1859, John Brown, the abolitionist, raided the armoury, and held it until captured next day by United States troops under Colonel R. E. Lee. In 1862 General Miles here surrendered with 12,500 men to Stonewall Jackson. Pop. (1900) 896.

Harper's Magazine, one of the most widely circulated of American magazines. It was founded in 1850. Its illustrations have for many years surpassed in quality anything produced in British magazines.

Harpignies, HENRI JOSEPH (1819), French landscape painter, born at Valenciennes; visited Italy with Corot in 1860, and in the following year exhibited his first important work, *Lisière de Bois sur les Bords de l'Allier*, in which the influence of Corot is apparent. *Le Saut de Loup* (1873), in the Luxembourg, Paris, is generally considered his masterpiece; there are also two other good pictures, *Evening* (1866) and *Rising of the Moon* (1884). He is an excellent water-colour painter—e.g. *Garden of the Villa Medici* at Rome.

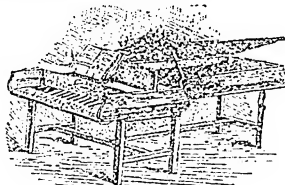
Harpocrates. See **HORUS**.

Harpoon, a weapon used in capturing whales and large fish. In its oldest form it consisted of a flat triangular piece of iron with strong barbs sharpened on the outer edges, attached to a wooden handle, to which was fastened a long rope. The harpoon now most commonly used is the 'toggle-iron'; it consists of a pointed shaft, in which is fastened, near the end, a pivoted crosspiece. On the rope being

pulled, after the shaft has penetrated the fibrous tissue beneath the blubber of the whale, the crosspiece (which at first lies along the shaft) sets at right angles, and so prevents the shaft from being withdrawn. Explosive harpoons have been tried, but are not satisfactory. The ordinary harpoon is used only to secure the whale, the animal being usually killed with a lance. The harpoon-gun is a gun from which a harpoon or toggle-iron, with line attached, can be fired. Some harpoon-guns are fired from the shoulder; others are swivel guns mounted on a pivot in the whale-boat.

Harpo-shell (*Harpa*), a genus of gastropod molluscs whose members are peculiar to warm seas. The shell is marked by prominent ribs arranged at regular intervals. Some twelve species are known, and fossil forms also occur in the Eocene of France.

Harpischord, one of the prototypes of the modern grand piano, which latter retains the external appearance of the earlier instrument. Instead of the hammer action of the piano, the harpischord had its tones produced by the action of points of quill, or of hardened leather, called 'jacks,' which plucked or twitched the strings when the keys were depressed. (See **CLAVICHORD**, **PRANOFORTE**, **SPINET**.) Unlike the clavichord, the harpischord was unable to produce gradations of tone; but by using two keyboards and introducing various mechanical devices—controlled by 'stops'—it was possible for the performer to play forte or piano at will.



Harpischord.

The tone thus obtained was glittering, metallic, and staccato, unsuited for the expression of poetic sentiment, but eminently adapted for a display of brilliant *tours de force*. Until the latter part of the 18th century, when it was superseded by the piano, the harpischord was not only a favourite solo instrument, but held an important position in the orchestra, being used by the conductor to lead his forces. Gluck was the first composer to exclude it from the orchestra. Handel's harpischord is preserved in S. Kensington Museum. See *Bie's History of the Pianoforte* (trans. by Kellett and Naylor, 1899).

Harpy, or **HARPY EAGLE** (*Thrasaetus harpyia*), a bird of prey, of the family Falconidae,



Harpy Eagle.

which inhabits Central and S. America from southern Mexico to Paraguay and Bolivia. It is of a general blackish-gray colour, with six black bars on the tail, and a bifurcated gray crest on the white head; the under surface is white, with a gray band on the chest. The bird, which is the king eagle of the Spaniards, is the most powerful of the American birds of prey, and attacks mammals much larger and heavier than itself; fawns, peccaries, monkeys, foxes are among its usual prey. It does not seem voluntarily to attack man. Related are *Harpyopsis nova guineae* and *Harpyhaliaetus coronatus* of S. and Central America, smaller birds than the true harpy, which measures thirty-eight inches. The harpies of Greek folklore were probably fruit-bats. See **HARPYIE**.

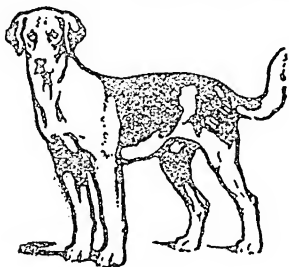
Harpyia, or **HARPIES** (i.e. 'snatchers'), in Greek mythology, were originally personifications of the swift storm winds. In later writers they are described as hideous winged monsters, who harassed the blind Phineus by snatching his food from him, or by defiling it.

Harquebus. See **ARQUEBUSE**.

Harraden, BEATRICE (1864), English novelist, born at Hampstead, near London. Her best books are *Ships that Pass in the Night* (1893), which had an extraordinary sale; *Untold Tales of the Past*, a book for children (1897); *The Fowler* (1899); *Katharine Frensham* (1903); and *The Scholar's Daughter* (1906).

Harrar, or **HARAR**, tn., Abyssinia, the most important place in the Galla country, 186 m. by rail (Dec. 1902) s.w. of Jibuti. It stands on a rock-bound hill, and is surrounded by walls. The country around produces coffee and tobacco. Pop. about 35,000.

Harrier, a dog which to the ordinary eye has all the appearance of a small foxhound, its height averaging from eighteen to twenty inches, while foxhounds vary from twenty-two to twenty-seven. But the points of the two breeds are nevertheless identical, though the head of the harrier is somewhat smaller in proportion, and the texture of the ears thinner, and they are some-



Harrier.

times rounded. Harriers, as their name implies, are used for hare-hunting; there are over one hundred and fifty packs in the United Kingdom. These hounds are not speedy, but display great perseverance in picking up a cold scent, and run with plenty of cheerful music. Ireland is especially well equipped with harrier packs, the long-legged Irish hare affording capital sport.

Harrier, a name given in combination to birds of prey belonging to the genus *Circus*. There are some seventeen species, widely distributed over the world. The sexes are unlike, and the soft plumage and neck ruff give a



Hen-harrier.

superficial resemblance to owls. The food consists of small mammals, and also of birds, reptiles, eggs, and so on. The following species occur in Britain: the marsh-harrier (*C. aeruginosus*), also called moor-buzzard; the hen-harrier (*C. cyaneus*), the male of which is sometimes called 'goshawk'; and Montagu's harrier (*C. cineraceus*).

Harrington, JAMES (1611-77), English political philosopher, was born at Upton, Northants. In his *Oceana* of 1656 he propounded a scheme for an oligarchical republic on the Venetian model, and in 1659 formed the Rota Club for the discussion of his theories. Works: *Oceana* (new ed. by Henry Morley, 1887); *Translations of Virgil's Eclogues and Æneid*, i.-vi. (1658-9); *Collected Works*, ed. J. Toland, with Memoir (1700, etc.).

Harrington, SIR JOHN (1561-1612), English courtier, born at Kelston, near Bath; became a favourite at the court of Elizabeth through his wit, and translated Ariosto's *Orlando Furioso* (1st ed. 1591). Offending by his freedom and political allusions, he left court and took part in the expedition of Essex to Ireland (1599), of which he wrote a journal (printed in *Nugæ Antiquæ*, 1769). After that he was appointed tutor to Prince Henry (son of James I.), for whose instruction he wrote *A Brief View of the Church of England* (1653). See Preface by Clements Markham to *Tract on the Succession* (Roxburghe Club, 1880).

Harrington, TIMOTHY CHARLES (1851), Irish politician, born at Castletown Bere, Co. Cork; entered Parliament for Co. Westmeath in 1883; has represented a division of Dublin since 1885. He was secretary and an active organizer of the Irish National League, and a faithful supporter of Parnell, whom he defended before the Special Commission of 1888-9. He became a member of the Irish bar in 1887.

Harriot, or HARIOT, THOMAS (1560-1621), English mathematician, a native of Oxford; was sent by Raleigh with Grenville's expedition to Virginia (1585), an account of which country he published (1588; reprinted in Hakluyt's *Voyages*, 1600). As a mathematician he was the first to modernize algebra. See his own *Artis Analyticae Praxis ad Aequationes Algebraicas Nova* (1631), Stevens's *Thomas Harriot* (1900), and *Harriot Papers*, ed. Rigaud (1831).

Harris, dist. and par. in the Outer Hebrides, Inverness-shire, Scotland, comprising the s. peninsula of the island of Lewis-Harris, a number of adjacent islands, and the distant island of St. Kilda. To the s. is the Sound of Harris, the only channel through the Hebrides available for ships. The peninsula is almost cut in two by W. and E. Lochs Tarbert. The inhabitants are mostly crofters and fishermen. The native wool is woven by handlooms into the well-known 'Harris tweeds,' Area, 123,757 ac.; pop. (1901) 5,271—both including islands.

Harris, SIR AUGUSTUS HENRY GLOSSOP (1852-96), English actor, dramatist, and theatrical impresario, born in Paris; appeared as Malcolm in *Macbeth* at Manchester (1873), and in comedy with Barry Sullivan. He joined Mapleson at Covent Garden; produced the pantomime at the Crystal Palace in 1876; was lessee of Drury Lane from 1879, and produced there pieces, of which he was part author, from *The World* (1880) to *Cheer, Boys, Cheer* (1895). His pantomimes and opera were also great successes. By 1891 he was manager of Her Majesty's, Covent Garden, Drury Lane, and the Olympic.

Harris, FRANK (1856), British journalist, born in Galway. In 1881 he joined the staff of the *Spectator* in London, and in 1882 became editor of the *Evening News*. He edited the *Fortnightly Review* from 1888 to 1893, when he bought the *Saturday Review*, of which he was editor till 1898. He is the author of *Elder Conklin*, and other stories (1895), *Montes the Matador* (1900), and a play, *Mr. and Mrs. Daventry* (1900).

Harris, GEORGE ROBERT CANNING (1851), fourth Baron Harris, better known as Lord Harris; early devoted himself to politics, and became under-secretary for India (1885-6), under-secretary for war (1886-9), governor of Bombay (1890-5). He is, however, best known as a cricketer: Kent's return to a place in the front rank of counties is in a large measure due to his energy and personal influence. In 1895 he was elected president of the Marylebone Cricket Club (M.C.C.).

Harris, HOWEL (1714-73), Welsh Methodist, was born at Trevecca in Brecknockshire, and became the principal founder of Welsh Calvinistic Methodism. Destined for the church, he began itinerant evangelistic work, and within two years after being deprived of his school, which was connected with the Established Church (1737), founded thirty societies in S. Wales. See his *Autobiography* (1791); Morgan's *Life and Times of H. Harris*.

Harris, JAMES (1709-80), English philologist, born at Salisbury. Entering Parliament for Christchurch (1761), he held the offices of lord of the Admiralty and lord of the Treasury. He was a follower of George Grenville, with whom he retired in 1865. In 1774 Harris became secretary and comptroller to Queen Charlotte. He is remembered chiefly for *Hermes*, or a *Philosophical Inquiry concerning Universal Grammar* (1751). His works were collected in 1801 by his son, Lord Malmesbury.

Harris, JAMES RENDEL, English Biblical scholar, was professor at Johns Hopkins University, Baltimore, and Haverford College, Pennsylvania, and lecturer in paleography at Cambridge, but since 1903 has been professor of theology at the University of Leyden, in Holland. He is an accomplished editor of MSS. of the New Testament and of the early Christian writings. In 1889 he discovered an important Syriac MS. of the 7th century in a convent on Mt. Sinai. Among his works are *The Teaching of the Apostles* (1887); *The Diatessaron* (1890); *The Apology of Aristides* (1891); *The Newly-Recovered Gospel of St. Peter* (1892); *Four Lectures on the Western Text of the New Testament* (1894); *Life of Francis William Crossley* (1899); *Annotators of the Codex Bezae* (1901); *The Dioscuri in Christian Legend* (1903); *The Guiding Hand of God* (1905).

Harris, JOEL CHANDLER (1848), American author, born at Eatonton, Georgia; joined the *Atlanta Constitution* (1876), where his first negro dialect stories appeared. His principal works are *Uncle Remus* (1880); *Mingo* (1884); *Free Joe* (1887); *On the Plantation* (1889); *Daddy Jake the Runaway* (1890); *Little Mr. Thimblefinger* (1894); *Mr. Rabbit at Home* (1895); *Aaron in the Wild-woods* (1897); *Aunt Minervy Ann* (1899); a d *Wally Wanderoon* (1904). In a more serious vein he has written a memoir of *H. W. Grady* (1890), and *Georgia from the Invasion of De Soto to Recent Times* (1899). From 1890 to 1905 he was chief editor of the *Atlanta Constitution*.

Harris, JOHN (?1666-1719), English divine and topographer, born probably in Shropshire; held several livings in the Church of England, also a prebend at Rochester (1708). He was the author of a *Dictionary of Arts and Sciences* (1704).

Harris, THOMAS LAKE (1823-1906), founder of a religious brotherhood, born at Fenny Stratford, Bucks; emigrated to the United States, and became (1850) imbued with spiritualistic doctrines. After lecturing on spiritualism in England (1838), he founded in America the 'Brotherhood of the New Life' (1860). His most notable disciple was Laurence Oliphant. Harris had no written creed or form of government, 'ruling as inspired.' The system was a mixture of Swedenborgianism and Fourierism, 'recognizing Scriptural authority, and the sanctity of marriage.' Harris published *Wisdom of Angels* (1856), *The Arcana of Christianity* (1857), *Modern Spiritualism* (1860), *The Millennial Age* (1861), and *The Great Re-*

public, a Poem of the Sun (1867). See Oxley's *Modern Messiahs and Wonderworkers* (1889); Allen's *T. L. Harris the Seer* (1897).

Harrisburg, city, Pennsylvania, U.S.A., co. seat of Dauphin co., and cap. of the state, on the E. bk. of the Susquehanna, 105 m. N.W. of Philadelphia. There are large railway shops and iron and steel works. Coal and iron are mined, and there is a trade in timber. It is the see of a Roman Catholic bishop, and possesses an imposing state capitol, a state arsenal, and a conservatory of music. Pop. (1900) 50,167.

Harrismith, tn., Orange River Colony, British S. Africa, 54 m. N.W. of Ladysmith. Pop. 1,660 (Whites, 942).

Harrison, or E. NEWARK, tn. in Hudson co., New Jersey, U.S.A., on the Passaic R.; has manufactures of cotton thread, electric lamps, etc. Pop. (1900) 10,596.

Harrison, BENJAMIN (1833-1901), president of the United States, born at North Bend, Ohio, his father being the son of a former president (William Henry Harrison). He bore a manful part throughout the civil war, receiving from Abraham Lincoln a commission as brevet brigadier-general (1865). Resuming his legal practice, he took an active share in General Grant's political campaign (1868-72). In 1888 he was returned as president of the United States in the Republican interest, and was immediately faced by the Bering Sea difficulty with Britain, which was, however, amicably settled in the following year. During his term the McKinley tariff was passed, and the annexation of Hawaii accomplished. He contested the presidency in 1892 against Cleveland, but was defeated. He also appeared as chief counsel for the United States in the dispute with Britain over Venezuela in 1899; and in the same year he represented the United States at the Hague Conference. He wrote *This Country of Ours* (1897), and *Views of an Ex-President* (1901). See *Life* by Lew Wallace (1888).

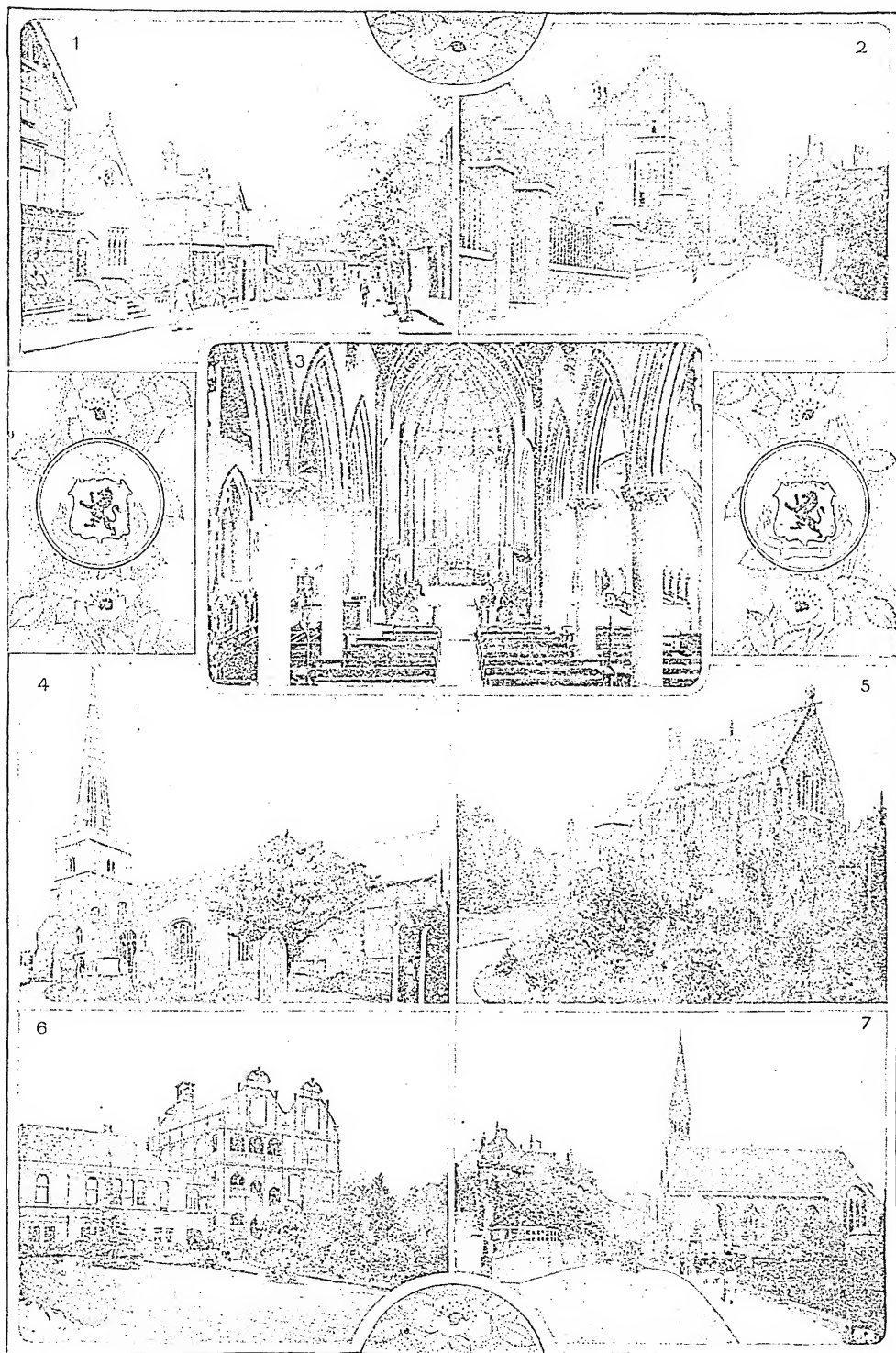
Harrison, FREDERIC (1831), English author and philosopher, born in London; was called to the bar in 1858. His chief legal distinctions have been an examinership and professorship in jurisprudence to Inns of Court (1877-89). To the discussion of labour problems he has brought a literary faculty equalled by few of his competers. Although a follower of Comte, he is tolerant, and approximates in his views to much of the broad-minded Christianity of the present day. He assisted Lord Westbury in codifying the law of

England; was a member of the Trades Union Commission of 1867-9, and secretary to the commission appointed to make a digest of the laws (1869-70). He has also revealed a rare critical faculty, which has found expression in some historical works whose temperateness of tone and sanity of judgment have given them a high value among students. His principal works are *The Meaning of History* (1862; new ed. 1894); *Order and Progress* (1875); *Oliver Cromwell* (1888); *Annals of an Old Manor House* (1893; new ed. 1899); *Early Victorian Literature* (1895-7); *William the Silent* (1897); *Tennyson, Ruskin, Mill, and other Literary Estimates* (1899); *Byzantine Hist. in the Early Middle Ages* (1900); *Life of Ruskin* (1902); *Theophano* (1904); *Chatham* (Twelve English Statesmen, 1905).

Harrison, JANE ELLEN (1850), English Hellenic scholar, born near Hull. After studying at Newnham College, Cambridge, she has lectured at Toynbee Hall and elsewhere; and is a lecturer in classical archaeology at Newnham College. She has published *Myths of the Odyssey in Art and Literature* (1882); *Introductory Studies in Greek Art* (1885); *Mythology and Monuments of Ancient Athens* (1890), conjointly with Mrs. Verrall; *Greek Vase Painting* (1894), with D. S. MacColl; and *Prolegomena to the Study of Greek Religion* (1903).

Harrison, JOHN (1693-1776), English mechanician, born at Foulby, near Pontefract, Yorks. His experiments in the construction of watches and clocks resulted in the 'gridiron pendulum' (1726), to counteract the effects of heat and cold. He claimed the prize offered by Act of Parliament in 1713 for the discovery of a method for determining longitude at sea to within a maximum error of thirty miles. But it was not until 1773, after the king had personally interposed on his behalf, that he received the full reward of £20,000. He was also the inventor of the recoil escapement.

Harrison, THOMAS (1606-60), Puritan, signatory to the death warrant of Charles I., was born at Newcastle-under-Lyme. Having joined Cromwell's army, he acted, during the latter's absence in Ireland, as chief in military command (1650-1). He was one of those who assisted in expelling the Long Parliament (1653). He was a member of Barebone's Parliament, but being left out from the subsequent council of state, was so embittered that he refused to acknowledge 'the Protector's new government' (1653). Deprived of his commission for



Views in Harrow.

1. The High Street. 2. One of the schools. 3. School Chapel. 4. Parish Church (St. Mary's). 5. Vaughan Library. 6. The Museum.
7. Speech Room and Chapel. (Photographed for this Encyclopedia by Barnard.)

connection with the Anabaptists, he was imprisoned (1655-6, also 1658-9). Suspicion fell on him at the restoration because he would neither leave the country nor acknowledge the new monarch, and he was sent to the Tower in May 1660, and executed four months later. See *Life in Complete Collection of Lives . . . of Persons lately Executed*, by A Person of Quality (1661), and in Noble's *Lives of the Regicides* (1798); also Simpson's *Thomas Harrison* (1905).

Harrison, WILLIAM (1534-93), English historian and chronicler, born in London, was rector of Radwinter in Essex (1559), till his death, combining therewith the canonry of Windsor from 1586. His *Description of England* (1577; 2nd ed. 1586-7) was intended to form part of a work (*An Universall Cosmographie*) planned by Reginald Wolfe. It gives a picturesque view of life and manners during the Elizabethan period. Extracts from his *Chronologic* are given in Furnivall's edition of the *Description of England* (1877-81).

Harrison, WILLIAM HENRY (1773-1841), ninth president of the United States, was born at Berkeley, Charles co., Virginia. He fought in the war of independence, gaining special mention at Fort Recovery for his gallantry. He was appointed governor first of the North-west Territory in 1798, and in 1801 of Indiana, which carried practically the dictatorship of Indian affairs. In 1811-13 he was actively engaged in the war with England and the Indian tribes. He filled successively high posts in the Senate till 1841, when he was elected to the presidency. See *Life* by Stoddard (1888), and by Bostwick in Wilson's *Presidents of the United States* (1894).

Harrison Steamship Line, established (1830) as the Charente Steamship Company, now conducts a cargo and passenger service between Liverpool and the W. Indies, United States, Mexico, Brazil, E. Indies, S.E. Africa, and the S. of France. It has a fleet of forty steamers, aggregating 194,323 tons.

Harrisse, HENRI (1830), French geographical historian, born in Paris, practised as a barrister in New York, but afterwards settled in Paris, and devoted himself to bibliography and the history of discovery. He has written *John Cabot* (1896); *Bibliotheca Americana Vetustissima* (1866); *The Discovery of North America* (1892, etc.); *The Diplomatic History of America* (1897); *Découverte de Terre-Neuve* (1900); but his best-known work is *Christophe Colomb*.

Harrogate, munic. bor. and watering-place, West Riding of

Yorkshire, 15 m. N. of Leeds. The first chalybeate spring was discovered in 1571, and there are now no fewer than eighty known springs, differing in strength and quality. The town consists of High Harrogate and Low Harrogate, the former built on the moor (alt. 596 ft.), the latter in a valley (alt. 300-350 ft.). Low Harrogate contains the thirty-two Bog Wells, no two of which contain waters of the same character, though they are only a few feet or yards apart. The best known is that of the Old Sulphur Well, now covered by the Pump Room, erected in 1842. Pop. (1901) 28,423.

Harrow. See IMPLEMENTS AND MACHINERY.

Harrow, or **HARROW-ON-THE HILL**, par. and tn., Middlesex, England, 9 m. N.W. of London. The famous school was founded in 1571, when Queen Elizabeth granted a royal charter to John Lyon. In 1720 there were 150 boys in the school, and it was then that the Whig element was introduced, and the friendly rivalry with the Tory Eton began. Of headmasters, Cox, in 1745, is said to have earned an unenviable notoriety by teaching in the school-yard with pint pot and pipe; but the prosperity of the school was established by Thackeray, Sumner, Heath, and Drury. During the headmastership of Drury there were five future prime ministers in the school—Spencer Perceval, Lord Goderich, Sir Robert Peel, Lord Aberdeen, and Lord Palmerston. Another of Drury's pupils was Lord Byron. In Dr. George Butler's reign (1895-29) the school numbers dropped to 128, owing chiefly to the financial stress throughout the country. Then came Longley, afterwards archbishop of Canterbury, and then Dr. Christopher Wordsworth. When he left in 1844 there were only 69 boys, and it is to the successful administration of Dr. Vaughan, Dr. H. M. Butler, Dr. Welldon, and Dr. Wood that the school owes its present prosperity. At the present time there seems to be a trend towards a modern and scientific training. There have been added lately music and drawing schools, and in the Butler Museum there is every facility for studying archaeology and natural history. The football rules are distinctive, the great feature about them being that there are no penalties. The chapel has lately been enlarged in memory of old Harrovians who lost their lives in the South African war. The school mission is maintained in a crowded district in Latimer Road, London. See Howson and Warner's *Harrow School* (1898).

Harry, BLIND. See HENRY THE MINSTREL.

Hart, the name given to the male deer from the time when the terminal snags or surroys of the antler appear—i.e. from the sixth year.

Hart, CHARLES HENRY (1847), American author, born at Philadelphia; practised at the bar from 1868 to 1894. He was already recognized as an authority on painting, and for many years (1882-1902) was director of the Pennsylvania Art Academy. He has devoted particular attention to the paintings of Gilbert Stuart, and has exposed many artistic frauds. His publications include *Life Portraits of Great Americans*; *Gilbert Stuart's Portraits of Women*; *Engraved Portraits of Washington*; *Turner the Dream Painter* (1879); *Frauds in Historical Portraiture* (1903).

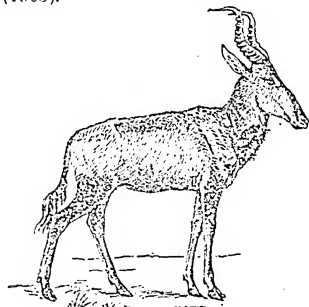
Hart, SIR ROBERT (1835), first baronet, inspector-general of Chinese customs; born at Portadown, Co. Armagh, and entered the British consular service in China (1854). After the Taiping rebellion he was secretary to the allied commission at Canton (1858), and entered the newly-organized Chinese customs service of which, in 1863, he became inspector-general. Under him the customs revenue has risen from 8,000,000 taels to over 27,000,000, and the staff from 200 to 5,704. About the land of his adoption he has written *These from the Land of Sinit* (1901).

Hart, SOLOMON ALEXANDER (1806-81), English historical painter, son of a Plymouth goldsmith and engraver, became a student in the Royal Academy (1823); elected R.A. (1840), professor of painting at the Academy (1854-63), and librarian (1865 until his death). His principal works, which were chiefly of Italian and historical subjects, include *The Elevation of the Law*—i.e. a Polish synagogue (1830); *Isaac of York in the Donjon of the Castle of Front-de-Bauf* (1830); *English Nobility receiving the Communion of the Catholic Church* (1831); and *Lady Jane Grey on Tower Hill* (1839). See *Reminiscences*, by A. Brodie (1882).

Hart-Dyke. See DYKE, HART.

Harte, FRANCIS BRET (1839-1902), American novelist and humorist, was born at Albany, New York. From 1868 to 1870 he edited the *Overland Monthly*, and during that time published *The Lost Galcon* (1867), *Condensed Novels* (parodies, 1870), and a poem, *The Luck of Roaring Camp* (1868), which attracted much attention by its novel blend of humour and homely pathos. It was in the same year that *The Heathen Chinese*

was printed. In 1870-71 he was professor of literature in California University, and in the latter year removed to New York. From that time he devoted himself almost entirely to literature, but acted as United States consul at Crefeld (1878-80), and at Glasgow (1880-85). After that he resided in England, and died at Camberley, in Surrey. The following may be cited as representative works: *Truthful James* ('Heathen Chinee'), and *Other Poems* (1872); *Tales of the Argonauts* (1875); *Gabriel Conroy* (1876); *The Twins of Table Mountain* (1879); *An Heiress of Red Dog* (1879); *In the Curquinez Woods* (1883); *Snow-bound at Eagle's* (1885); *A Phyllis of the Sierras* (1886); *The Heritage of Dedlow Marsh* (1889); *A Waif of the Plains* (1890); *A Protégée of Jack Hamlin's* (1894); *Barker's Luck* (1896); *Mr. Jack Hamlin's Mediation* (1899); *Under the Redwoods* (1901); *On the Old Trail* (1902). A collection of his works appeared in 1891-1902. He owed his success to his command of humour and quiet pathos, his power of vivid description of the rough and picturesque life of the settler and the miner, and his gift of turning graceful as well as humorous verse. See *Lives* by Pemberton (1903) and Boynton (1905).



Hartebeest.

Hartebeest, a name applied in S. Africa to a number of antelopes of the genus *Bubalis*, from a fancied resemblance to a stag. The true hartebeest is *B. cama*, one of the fastest of the antelopes. It stands about four feet at the withers, and is of a general grayish-brown colour, with black markings on the forehead and nose. The horns are long, diverge from each other in the form of a V, and have their tips directed backwards at a right angle. The animal ranges as far north as Matabeleland and Mashonaland.

Hartford. (1.) City, Connecticut, U.S.A., co. seat of Hartford co., and cap. of the state, 35 m. E.N.E. of New Haven. It manufactures steam-engines, bicycles, automobiles, and firearms, and

has numerous insurance companies. It has a handsome white marble capitol, and is the seat of Trinity College. Pop. (1900) 79,850. (2.) Capital of Blackford co., Indiana, U.S.A., 60 m. N.E. of Indianapolis; manufactures glass, machinery, and washing machines. Pop. (1900) 5,912.

Hartford Convention. On the outbreak of the war of 1812-14 between Great Britain and the United States, the New Englanders held a convention at Hartford, Connecticut, in December 1814, to consider what should be done to protect their interests, when resolutions were adopted claiming the right, among other things, to reserve for each state the proceeds of certain federal taxes, so as to provide for the defence of the state.

Harting, JAMES EDMUND (1841), English scientist, born in London. Retiring from practice as a solicitor in 1878, he pursued his favourite studies of zoology, especially ornithology, and was appointed librarian to the Linnean Society (1888). He actively promoted the passing of the Sea Birds Preservation Act (1869), and drafted the bill for the protection of wildfowl. Editor of the *Zoologist* (1877-96), he has also been connected with the *Field*. He visited Thessaly in 1893 for the Board of Agriculture, to report on the vole plague. He has published *The Birds of Middlesex* (1866); *A Handbook of British Birds* (1872; new ed. 1901); *Our Summer Migrants* (1875); *British Animals Extinct within Historic Times* (1880); *Hints on the Management of Hawks* (1898); *The Rabbit, in the Fur and Feather Series* (1898); and editions of White's *Natural History of Selborne* (1875-6) and of Walton's *Complete Angler* (1893).

Hartington, LORD. See DEVONSHIRE, DUKE OF.

Hartland, EDWIN SIDNEY (1848), English folklorist and author. Among his publications are *English Fairy and other Folk-tales* (1890); *The Science of Fairy Tales* (1890); *The Legend of Perseus* (1894-6), a standard work; and numerous papers on anthropological and archaeological subjects.

Hartlepool, munic. and parl. bor., seaport, and bathing resort, Durham co., England, on a peninsula which partly shelters the harbour to the S. With West Hartlepool and other townships it forms the parliamentary district of Hartlepool, returning one member to the House of Commons. It was a considerable port long prior to the 17th century, when it began to decline. Its revival is due to the discovery of coal in the vicinity in 1831. West Hartlepool, 2 m. to

S.W., a munic. and co. bor., and now the more important centre, grew up during the latter half of the 19th century, its population in 1845 numbering about 300. The industries of the Hartlepoons include iron and steel works, electrical works, iron ship-building, steam timber and corn mills. The docks cover 200 acres. The North-Eastern Railway Co. are effecting great dock extensions and improvements (1906-1907). The port (West Hartlepool) has great trade in coal and timber, the total exports in 1903 amounting to £1,058,866. Pop. (1901): Hartlepool (munic. bor.) 22,737; West Hartlepool (munic. bor.) 62,614; Hartlepool (parl. dist.) 86,310.

Hartley, SIR CHARLES AUGUSTUS (1825), engineer-in-chief to the European commission of the Danube since 1856, born at Heworth in Durham. In 1875 he was appointed a member of the Engineering Board to report on the improvement of the Mississippi; in 1884 he was the British member of the International Technical Commission of the Suez Canal; in 1879 he was arbitrator in a dispute between the Metropolitan Board of Works and the conservators of the Thames; and for his engineering services has been awarded the Telford, Watt, and Stephenson medals. He has written on the *Delta of the Danube*, *Inland Navigations in Europe*, *History of the Engineering Works of the Suez Canal*, and *The Theory and Practice of Hydro-Mechanics* (1885).

Hartley, DAVID (1705-57), English philosopher, born near Halifax, and practised as a physician. In 1749 he published the work by which he is chiefly remembered, *Observations on Man*. Though sincerely theistic in purpose, the book was materialistic in so far as it explained mental phenomena of the mind as proceeding from molecular nervous vibrations. See *Life* by his son prefixed to *Works* (1791).

Hartlib, SAMUEL (c. 1600-?1670), son of a Polish merchant, was born at Elbing in Prussia. He came to England about 1628, and became acquainted with Milton, who dedicated to him his treatise *Of Education* (1644). See *Memoir* by Direks (1865).

Hartmann, ALFRED (1814-97), Swiss author, born near Langenthal, Bern; practised law at Solothurn. He is best known by his Swiss romance, *Meister Putsch und seine Gesellen* (1858). Among his other works are *Junker und Bürger* (1865); *Fortunat* (1879); *Der Gerechte Bräuntnetzbrenner* (1881); and *Lives of Martin Disteli*, the painter (1861), and H. J. von Staal (1861). See *Life* by Arx (1902).

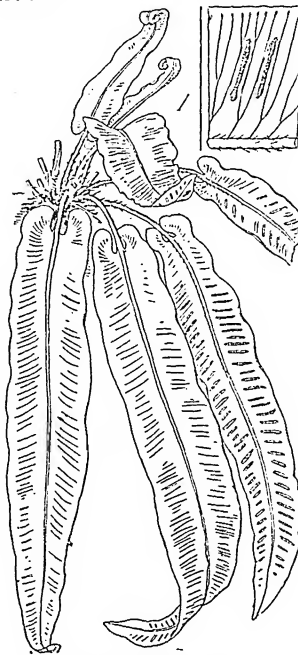
Hartmann, KARL ROBERT EDUARD VON (1842-1906), German philosopher, born at Berlin. With the publication of *Philosophie des Unbewussten* in 1869 (10th ed. 1890) he won for himself a conspicuous position among philosophical writers. In a broad sense a follower of Schopenhauer, he substitutes for the will, which that thinker took as his world-principle, the even vaguer conception of the unconscious. He similarly accepts, but modifies, the pessimism of Schopenhauer. The unconscious contains within itself both will and intelligence; but inasmuch as it is in the former capacity that it creates the world, the world, as the product of a blind force, is full of misery, from which only the development and spread of knowledge can deliver suffering humanity, by freeing men from their illusions, and enabling them to negate the will to live. But, unlike Schopenhauer, Hartmann makes this deliverance of humanity depend, not on the present asceticism of the individual, but on a remote collective experience of the race in the future. His early work has been translated by Coupland (1884). Other works in which his views are substantially expounded are *Phänomenologie des sittlichen Bewusstseins* (1878; 2nd ed. 1885); *Das religiöse Bewusstsein der Menschheit* (1882); *Die Religion des Geistes* (1882); *Die deutsche Aesthetik seit Kant* (1886); *Die Philosophie des Schönen* (1887); *Geschichte der Metaphysik* (1900); and *Die Weltanschauung der modernen Physik* (1903). His principal works appeared as *Ausgewählte Werke* (1885-90).

Hartmann von Aue (c. 1170-1210), German poet. He appears to have been a Swabian by birth, a knight in rank, and a man of superior education for his age. He joined a crusade to the Holy Land, most likely that of 1197, and was living in 1210, but already dead before 1220. We have from his pen lyrical poems, and four longer works—*Gregorius*, a tragic legend of the early life of Pope Gregory the Great; *Der arme Heinrich*, upon which Longfellow based his *Golden Legend*; *Erec*, and *Iwein*, two translations, or, more correctly speaking, free renderings, of the *Erec* and *Chevalier au Lion* of Chrétien de Troyes. It was to these two poems that Hartmann principally owed his contemporary popularity. His versions often present alterations, additions, and rearrangement of incident, the source of which it is not always easy to determine. Not only was Hartmann's style admirable, but he had a much keener sense of the unities than had Chrétien de

Troyes, and a much greater faculty for telling a clear and probable story. Hartmann's *Werke* have been edited by F. Bech—*Deutsche Klassiker des Mittelalters*, vols. iv-vi. (3rd ed. 1891, etc.).

Hartshorn, SPIRIT OF, the old name for solution of ammonia.

Hart's-tongue Fern, or **SCOLOPENDRIUM**, an evergreen genus characterized by its fructification—viz. sori confluent in pairs—placed face to face. There is only one British species, *S. vulgare*, with shining, undivided fronds.



Hart's-tongue Fern.

1, Portion of frond, with fructification.

Hart-Synnot, ARTHUR FITZROY (1844), British soldier, served in Ashanti (1873-4), Zululand (1879), S. Africa (1881), Egypt (1882), being wounded at Tell-el-Kebir; and, on the outbreak of hostilities in S. Africa, he was placed in command of the Fifth (Irish) Brigade in the Natal campaign; was present at Colenso, Spion Kop, Pieter's Hill, and the relief of Ladysmith (1900).

Hartz. See HARTZ MOUNTAINS.

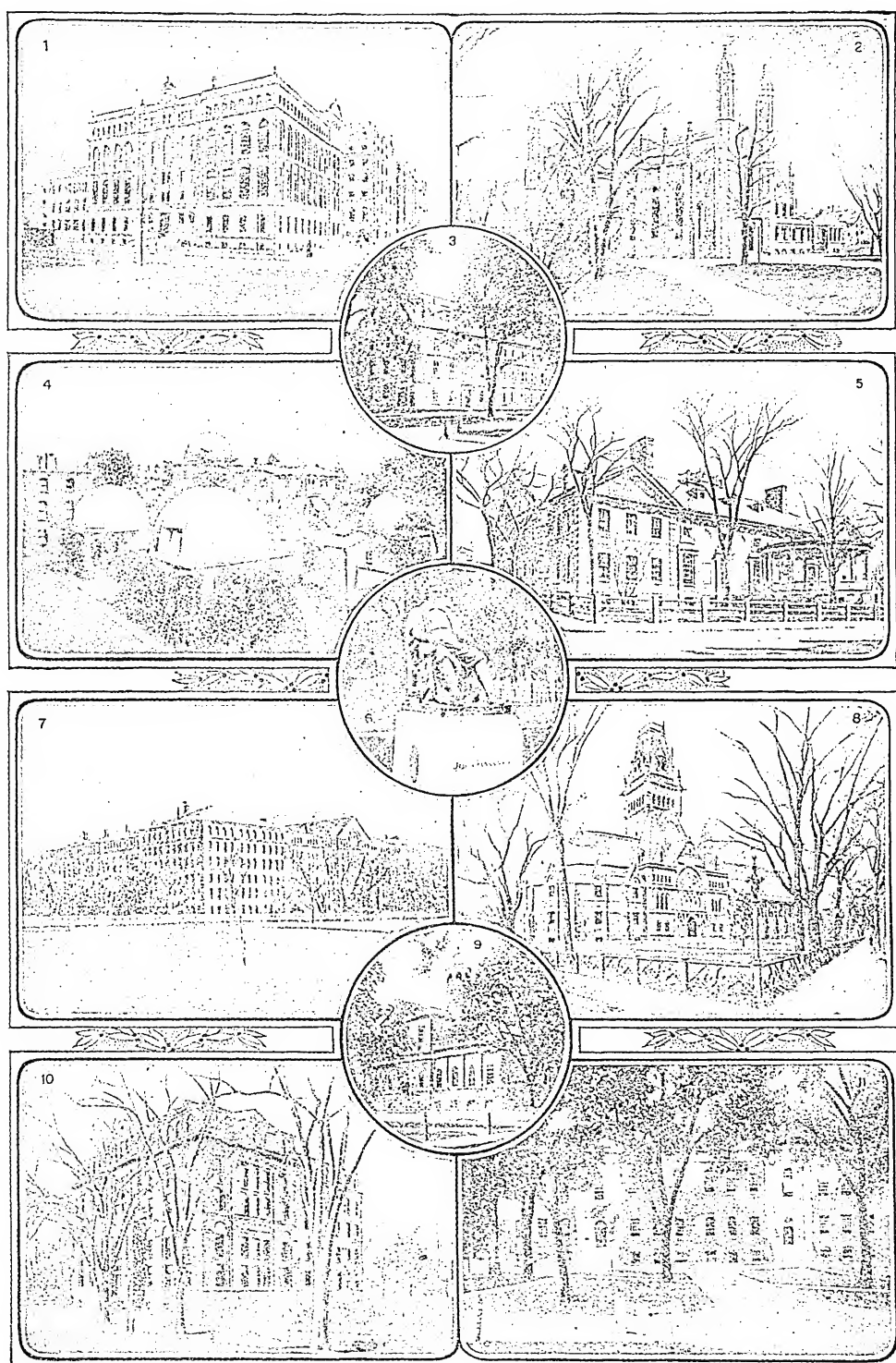
Hartzenbusch, JUAN EUGENIO (1806-80), Spanish man of letters, of German parentage, born at Madrid; was a prolific writer in prose and verse, editor of Spanish classics, and member of the Academy. His best-known work is a sentimental poetic drama called *Los Amantes de Teruel* (1836), a legend which had also attracted Tirso de Molina and Montalban.

Hartzenbusch's works are current in Spain—one vol. of *Poesias*, one of *Fabulas*, and three of *Dramas*.

Harun. See HAROUN AL-RASCHID.

Haruspices, in ancient Rome, were diviners who interpreted the will of the gods from the entrails of slaughtered victims, or from extraordinary portents. They originally came from Etruria. They were never formed into a regular guild, were not priests, and politically were never so important as the augurs.

Harvard University, one of the oldest and best endowed educational institutions in the United States of America, is situated at Boston and Cambridge, Massachusetts. It originated in 1636 as the New Town, soon changed, however, to Cambridge. Two years later the name underwent another change, to perpetuate the memory of the Rev. John Harvard, an English nonconformist clergyman, who bequeathed half of his estate and his library to the new college. Harvard in 1905 had an attendance of 5,283 students, and an income of £350,000. A new era dawned in 1869, when President Eliot began his scheme for the reorganization of the college, and the affiliation of the semi-independent professional schools. The university is governed by two boards—the corporation (in whom the property of the university is vested), and the board of overseers, chosen from the alumni of the university. One of the modern features on the athletic side is the steel and concrete stadium, capable of seating nearly 30,000 people, on the football ground near the Charles R. In 1903 there were in or near Boston the following departments: Medical school and dental school, Bussey institution for agriculture and horticulture, veterinary school and Arnold arboretum; in Cambridge, Harvard College, Lawrence scientific school, and graduate school, law school, divinity school; university library (containing 607,000 vols. and 265,000 pamphlets), Agassiz museum (of comparative zoology), Peabody museum (American archaeology and ethnology), botanical and geological museum, botanic gardens, Gray herbarium, astronomical observatory. Besides these, there are the Radcliffe College for women, organized in 1879, and under the control of the president and fellows of Harvard; the Memorial Hall (erected in honour of the graduates who fell in the civil war); Harvard Hall, University Hall, Appleton Chapel, and Gore Hall. On the roll of distinguished alumni the names of Emerson, Holmes, and Lowell are conspicuous.

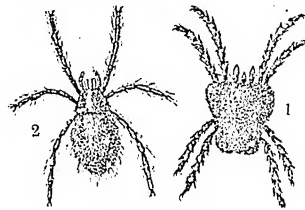


Harvard University.

1. The Medical School. 2. Gore Hall, the College Library. 3. Massachusetts Hall. 4. The Astronomical Observatory. 5. The Harvard Union. 6. Statue of John Harvard. 7. University Museum. 8. Memorial Hall and Sanders Theatre. 9. Harvard Hall. 10. Peabody Museum. 11. University Hall.

Harvest Customs. The season of harvest has been immemorially celebrated as a time of rejoicing. 'The joy in harvest' was a proverbial expression among the ancient Jews, who, moreover, testified their gratitude to the Giver of the harvest by a religious festival. Longfellow has shown how the early Algonquins associated the maize harvest with light-hearted prophecies. The Indian maid who was fortunate enough to find a red ear beneath the husk was sure of a handsome husband; but a mildewed, crooked little 'nubbin' betokened a deformed old man. In the 'husking-bee' of the European colonists we see a continuation of the native ideas and customs. Among other Red Indian tribes autumnal offerings were made to the divinity of the corn, who was conceived to be an old woman. The picturesque Greek story of Proserpine is now interpreted as an allegory, Proserpine personifying the corn, which dies or, as it were, goes underground in autumn, to reappear in spring. Mannhardt translates the name Demeter (the mother of Proserpine) as signifying 'corn-mother.' Thus, Demeter and Proserpine are merely the prototypes of the 'corn-mother' and the 'maiden' of mediæval and modern European rustics. This identity is apparent in the symbols used by ancients and moderns alike. The *ciresione* of ancient Greece was a branch of olive or laurel, bound about with ribbons and hung with a variety of fruits. It was carried in procession at the harvest festival, and thereafter fastened over the door of the house, where it remained until the following autumn. The same usage has persisted to the present day throughout Europe, with slight modifications. In the Scottish Highlands the last handful of standing corn is called the 'maiden,' and it is cut by a young girl with due formality. The slender sheaf is then plaited, decked with ribbons, and hung on the kitchen wall of the farmhouse, there to remain until it has to give place to next year's 'maiden.' After the harvest supper, and before the dance begins, the company successively drink in salutation to the 'maiden.' In ancient Greece and in modern Scotland the motive (no longer popularly realized) is the preservation of the life-giving spirit of the crop, without which the seed would be sown in vain in the succeeding spring, and the vineyards and olive groves be blighted. In some parts of Scotland and northern England the harvest-home is called the 'kirk,' and the last sheaf becomes the 'kirk-

baby,' or (in Yorkshire) the 'mell doll.' The 'joy girl' is the Kentish analogue. In Germany such terms as the 'child' and the 'harvest child' are given. Dr. Frazer observes that the parallel with the Greek Demeter and Proserpine seems to be absolutely complete in certain parts of Scotland, where the harvesters preserve the 'old woman' as well as the 'maiden.' The Devonshire custom of 'crying the neck' is a variant of those described above, but it has also affinities with other usages which arise from the conception of the corn-spirit as an animal. A most minute and comprehensive survey of harvest customs is contained in Dr. Frazer's *Golden Bough* (1900), whence most of the foregoing facts are drawn.



Harvest-mite.

1. *Trombidium holosericeum*. 2. Larval form, *Leptus autumnalis*. (x 6.)

Harvest-mite, or HARVEST-BUG (*Trombidium holosericeum*), a bright scarlet mite which in its larval state sometimes lives parasitically on man. The larval form, formerly called *Leptus autumnalis*, is found in great abundance on gooseberry bushes, grass, and herbage in general. These larvæ are parasitic, and attack insects and various mammals, notably man. In the last case they are apparently capable of penetrating the skin only in places where this is thin, as under the knees, between the toes, and so on. Here they set up great irritation. After a certain lapse of time the mites leave their host, drop to the ground, and begin the free-living life, in which they feed upon minute insects. The usual remedies are to apply ammonia, eaul-de-luce, or spirits of wine, and then cover the affected area with oil or vaseline. See MITES.

Harvest Moon, the full moon nearest to the autumnal equinox. The moon's path being then least inclined to the horizon, she rises night after night with slight retardation, and there results a comparatively long succession of moonlit evenings.

Harvest-spiders, or HARVEST-MEN (Phalangidae), an order of arachnids differing from spiders in that there is no distinct constriction or waist between the cephalothorax and abdomen, that

the latter is distinctly segmented, that breathing is carried on entirely by tracheæ or air-tubes, and in some other respects. Harvest-men are long-legged, nocturnal animals, feeding upon spiders and insects, and usually soberly coloured. An example is *Oligolophus spinosus*.

Harvey, tn. of Cook co., Illinois, U.S.A., 20 m. s. of Chicago, of which it is a residential suburb. Pop. (1900) 5,395.

Harvey, GABRIEL (?1545-1630), English poet, born at Saffron Walden, Essex. He became an intimate friend of Spenser, was the Hobbinal of *The Shepheard's Calendar*, and engaged in fierce paper war with Greene and Nashe, the satirists. After Nashe's famous *Hare with you to Saffron Walden* (1596), and Harvey's *Trimming of Thomas Nashe* (1597), all the books were forbidden by authority (1599). Harvey practised physic and astrology, and died in retirement at Saffron Walden. See *Works* (ed. A. B. Grosart, 1884-5).

Harvey, SIR GEORGE (1806-76), Scottish painter, born at St. Ninian's, Stirlingshire; was one of the original associates and founders of the Scottish Academy, and became an academician in 1829, and president in 1864. He was author of *Notes of the Early History of the R.S.A.* (1870; 2nd ed. 1873). His chief works are pictures of Scottish life in history, which are popular in engravings—namely, *Covenanters Preaching* (1830), Glasgow; *Battle of Drumclog* (1836); *Shakespeare before Sir Thomas Lucy* (1836); *Covenanters' Communion* (1840); *Quitting the Manse* (1847), in National Gallery, Scotland; *Last Sleep of Argyll* (1841); *Blowing Bubbles in Greyfriars' Churchyard* (1849). See *Recollections* (privately printed, 1888); Simpson's (illustrated) *Selections from the Works of Sir G. Harvey* (1869).

Harvey, SIR HENRY (1737-1810), British naval officer; was in command of the *Ramillies* in Lord Howe's victory of June 1 1794, and took part in Bridport's action off L'Orient (1795). On Bridport's return to England Harvey took charge of the blockading squadron off Brest. In 1797 he left Martinique with a body of troops under Sir Ralph Abercromby, and took part in the capture of Trinidad. In 1804 he became an admiral.

Harvey, JOHN (1740-94), British naval officer; assisted in the defence of Gibraltar during the famous siege. In command of the *Brunswick* in Lord Howe's battle of June 1, 1794, Harvey made himself famous, and was mortally wounded in a desperate struggle against the *Vengeur* and the *Achille*.

Harvey, JOHN MARTIN, English actor, born at Wyvenhoe, Essex. His first great success, in Maeterlinck's *Pelléas and Mélisande*, at the Prince of Wales's (June 1898), was followed by his notable creation of the character of Sydney Carton in *The Only Way*, adapted by Mr. Freeman Wills from Dickens's *Tale of Two Cities* (Lyceum, 1899). He has successively been manager of the Lyceum, Prince of Wales, Court, Royalty, and Apollo theatres. Mr. Martin Harvey is one of the greatest of the younger English actors.

Harvey, WILLIAM (1578-1657), who discovered the circulation of the blood, was born at Folkestone, Kent. He was in 1609 appointed physician to Bartholomew's Hospital, London, and became Lumleian lecturer in 1615. In his course of lectures he enunciated the theory of the double circulation of the blood, and his demonstrations had convinced many of the truth of his belief years before 1628, when his essay on the subject was published. Fabricius and Servetus to some extent forestalled him, but it was reserved for Harvey to prove by

shape in comparatively low steel, such as Bessemer steel or open-hearth steel, containing, say, from 0.10 to 0.35 per cent. of carbon, it is laid perfectly flat in a bed of finely powdered clay or sand, upon the bottom of a fire-brick cell or compartment erected within the heating chamber of the furnace. The compartment is filled in with granular carbonaceous material, which is rammed down upon the plate and covered with a stratum of sand. On the sand is laid a covering of heavy fire-bricks. The furnace is then raised to an intense heat, equal

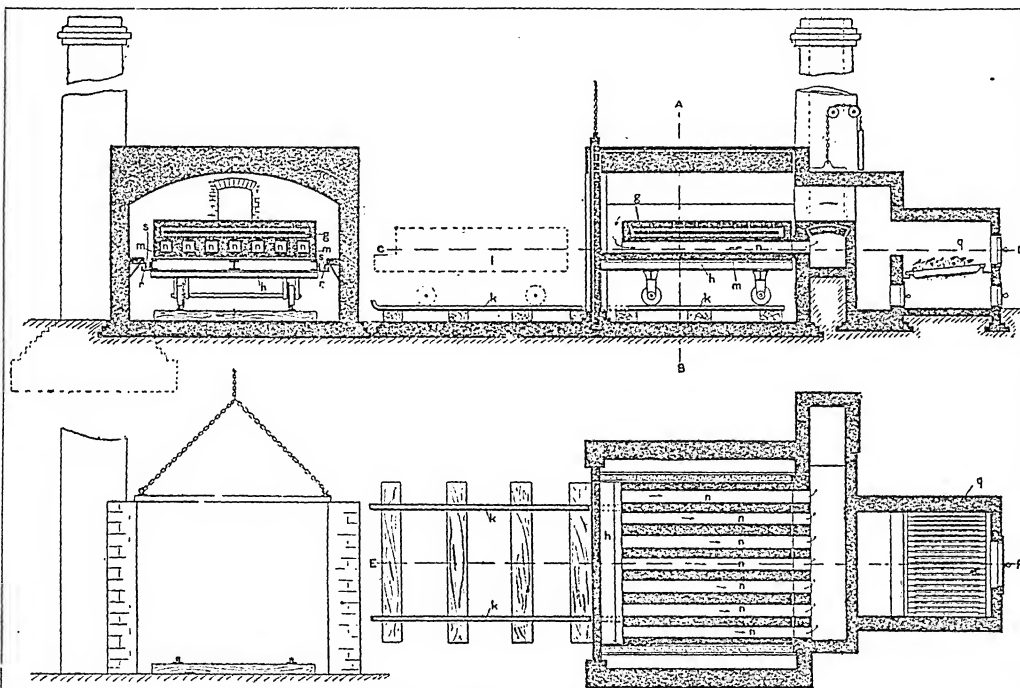


Diagram of Harveyed Steel Process.

The steel plate *g* is placed on a truck *h*, which can be moved on rails *k* to a position *l* outside the furnace. The truck is covered with firebrick *m*, through which are flues *n*. The plate, covered with granular carbonaceous material, and with a layer of sand and firebrick *p*, is heated by gases from the furnace *f* passing, as shown by the arrows, over the top of the plate and back to the chimney by the flues *n*, underneath the plate. The frame of the truck is protected from the heat by channel irons *r*, *r*, fixed to the truck and filled with sand, into which the angle irons *s*, fixed to the sides of the furnace, dip when the truck is pushed into the furnace.

Harvey, SIR THOMAS (1775-1841), British naval commander, served as master's mate in the *Ramillies* in the battle of June 1, 1794, and as lieutenant in the *Prince of Wales* in Bridport's action off L'Orient in 1795, and commanded the *Pelican* at the reduction of Trinidad in 1797. He afterwards shared in the capture of Surinam in 1799, and in the reduction of the Danish and Swedish West India islands in 1801. In 1807 Harvey took part in the passage of the Dardanelles. He was made a vice-admiral in 1837, and later was commander-in-chief on the N. American station.

careful reasoning and demonstration that the contractions of the cardiac ventricles propel through the pulmonary and systemic arteries the same blood which the pulmonary and systemic veins return to the cardiac auricles. His other great work on generation is of less value, chiefly because it was done in the days before the microscope.

Harveyed Steel, steel face-hardened by the process invented by Mr. H. A. Harvey. The treatment is chiefly applied to armour plates. By this invention, when the armour plate has been brought to the desired size and

to that required to melt cast iron. The heat is kept up, generally for about 120 hours, until the face of the steel has absorbed enough carbon to harden it an additional amount, in some cases, of one per cent. The amount of heat and the length of time required depend upon the thickness of the armour plate, and results can only be assured by experience. In addition to the high temperature, a firm pressure of the carbonaceous material against the steel is necessary. About three inches of super-carbonization are usual for a 10½-in. plate. When the super-carbonized surface has

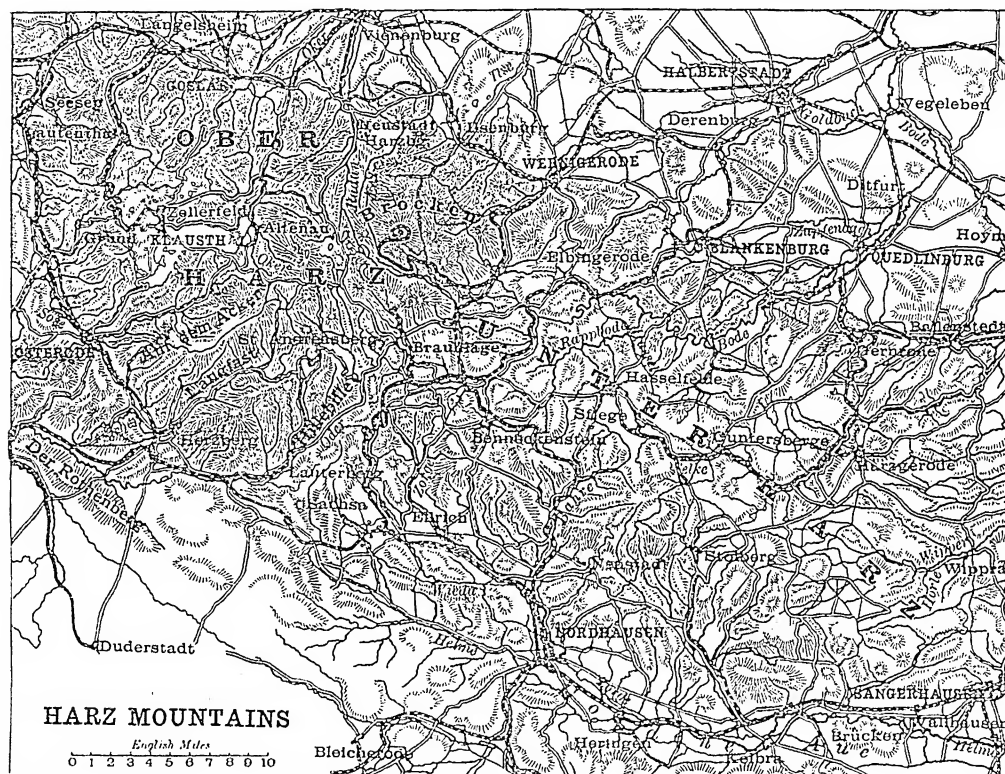
cooled down so as to have a dull cherry-red colour, the carbonaceous material is removed quickly, and the plate is chilled by being sprayed with torrents of cold fluid or running water, so that the surface is uniformly hardened. When a plate of steel 10½ in. thick has been treated in the above way, a hardened projectile of 6 in. diameter, and weighing 100 lbs., fired at it with a striking velocity of 2,000 ft. per second, will be shattered to fragments without deeply penetrating. Owing to the tenacity of Harveyed steel, and the entire

Capercaillie in Scotland (1879); *History of the Squirrel* (1881); *Reports on the Migration of Birds*; *Vertebrate Fauna of Sutherland*, etc. (1887). *Vertebrate Fauna of the Outer Hebrides* (1888), *Vertebrate Fauna of the Orkney Islands* (1891), *Fauna of the Moray Basin* (1895)—the last four in conjunction with Mr. T. E. Buckley—*The Wonderful Trout* (1898); and *Travels of a Naturalist in Northern Europe* (1905). See *Bibliography* of his writings (1896).

Harwich, a munic. bor., seapt., and naval station in Essex, England, 70 m. N.E. of London, on a

Harzburg, favourite summer resort of the Harz Mts., Germany, at the N. foot of the Brocken, 28 m. by rail S. of Brunswick, comprising the three adjoining villages of Neustadt, Bündheim, and Schlewecke. It possesses saline waters, and is overlooked by the Burgberg (1,520 ft.), crowned by the ruins of a castle built by the Emperor Henry IV. in the 11th century, and by the 'Canossa pillar,' put up in honour of Bismarck in 1877. Pop. (1900) 3,806.

Harz Mountains, mountainous region in the middle of Germany, at the S. edge of the great



homogeneity of the plate, there is no cracking or peeling, nor, except in the case of very heavy projectiles, any complete piercing.

Experiments have shown that steel with an alloy of nickel is more useful than simple steel for armour-plate purposes; and when the Harvey process is applied in addition, the results are the best so far obtainable.

Harvie-Brown, JOHN A. (1844), Scottish naturalist, was born in Edinburgh. His researches in natural history have been mainly devoted to the vertebrate fauna and the migration of birds. His chief works are *The*

peninsula at the confluence of the Stour and Orwell; it is fortified, and has cement works, shipbuilding, and fishing. Imports (1905), £18,197,675; exports, £4,786,403. Off the town Alfred's fleet encountered the Danes in 885, and in 1666 a naval engagement took place between the Dutch and the English. Dovercourt, the residential part of Harwich, is a favourite seaside resort. Pop. (1901) 10,019.

Harwood, GREAT, tn., Lancashire, England, 3 m. N.W. of Accrington; has cotton manufactures and coal mines. Pop. (1901) 12,014.

N. German plain; measures 55 m. from W.N.W. to E.S.E. and 20 m. from N. to S. It falls pretty steeply on all sides, but more especially on the N. The general altitude is from 2,000 to 3,500 ft.; but the Brocken culminates in 3,750 ft. Being well forested and richly endowed with the wild and gloomy associations of the Teutonic imagination, the Harz Mts. are a favourite summer resort. The Rosstrappe, Hexentanzplatz, Teufelsmauer, Brocken, all recall weird fancies of popular folklore. The summit of the last-named is frequently shrouded in mist, which supplies what of sub-

stance there is in 'the spectre' of the Brocken. Harzburg, Thale, Alexisbad, Hubertusbad, and other places offer mineral waters, pine-needle and other baths, whey-cures, etc. Mining for silver and lead has been carried on for hundreds of years, the chief centres being St. Andreasberg and Klausthal. Since 1898 a rack-railway has afforded access to the summit of the Brocken. See *Der Harz*, ed. by H. Hoffmann (1899).

Hasa, or EL HASA, Arabian coast-land, on the Persian Gulf, some 31,000 sq. m. in area, and is included in the Turkish vilayet of Basra. Dates, rice, cotton, and indigo are cultivated, and camels reared. El Hofuf and Koweit (Graue) are the chief towns. Pop. about 150,000.

Hasden, BOGDAN PETRICEIU (1838), Roumanian philologist and historian, born near Khotin in Bessarabia; appointed professor at Bucharest (1864) and keeper of the national archives. His historical works carry great weight, owing to their broad and original views. Among them are *The Critical History of the Roumanians* (2 vols. 1875); *Cuvintele din Batrani* (2 vols. 1878-81); *Etymologicum Magnum Romanice*, the dictionary of the Roumanian language (3 vols. 1887-93); and *Strat și Substrat* (1893), a study on the origins of the Balkan races.

Hasdrubal, ancient Carthaginian leaders. (1.) The son-in-law of Hamilcar Barca, who, on the latter's death in 228 B.C., succeeded to the chief command in Spain. He founded New Carthage, and made a treaty with the Romans, by which the Ebro was fixed as the boundary between the Carthaginian and Roman spheres of influence. He was murdered by a slave in 221 B.C. (2.) The brother of Hannibal, by whom he was left in command of Spain when Italy was invaded in 218 B.C. He fought for years, successfully on the whole, against the two Scipios; and in 207 invaded Italy to aid Hannibal, but before they could join their forces he was defeated by Claudius Nero and Livius at the Metaurus in 207, himself being killed.

Hase, KARL AUGUST VON (1800-90), German theologian, was a native of Steinbach in Saxony. In 1829 he became professor of philosophy at Leipzig, and in the same year professor of theology at Jena. In his *Leber Jesu* (1829; trans. 1881) he anticipated the arguments of Strauss. His best known works are *Die Leipziger Disputation* (1827), *Theologische Streitschriften* (1834-7), *Die Tübinger Schule* (1855), *Hutterus Redivivus* (1828; 12th ed. 1883), *Lehrbuch der Kirchengeschichte* (1834; 11th ed. 1886; trans. 1855), *Die Beiden*

Erzbischöfe (1839), and an edition of *Libri Symbolici Ecclesie Evangelice*. See *Life*, in German, by Buerkner (1900).

Hashish, an Arabian confection, prepared from the flowering tops of Indian hemp (*Cannabis sativa*). It is used in several countries as an intoxicant (*bhāng* in India), and the tincture and extract have been employed in medicine as an anodyne, hypnotic, and antispasmodic. In large doses these preparations quicken the circulation, and exhilarate the spirits, producing a kind of mirthful delirium, during which the sensations are pleasurable and visionary. See *HEMP*.

Haslemere, par. and tn., Surrey, England, 12 m. s.w. of Guildford. At Aldworth, a mansion in the Tudor style, 2½ m. distant (Sussex), Lord Tennyson died in 1892, and Hindhead House was the residence of Professor Tyndall. Pop. (1901) 2,613.

Haslingden, mkt. tn. and bor., 8 m. w.n.w. of Bury, Lancashire, England. It has manufactures of cotton, woollen and cloths, and blankets. It has a 13th-century church. There are stone quarries, coal mines, and iron works. Pop. (1901) 18,543.

Hasmonæans. See *ASMONEANS* and *MACCABEES*.

Haspe, tn., Prussian prov. of Westphalia, 11 m. by rail N.E. of Barmen; iron industries. Pop. (1900) 16,039.

Hassall, ARTHUR (1853), English historian, student of Christ Church, was born at Bebington, Cheshire. In 1880 he succeeded Mr. Herbert Gladstone in charge of the history work at Keble College, and in 1883 Dr. Kitchin at Christ Church. His principal works include *The Balance of Power* (1896; 2nd ed. 1898), *Bolingbroke* (1889), *Louis XIV* (1895), *The French People* (1901), *Mazarin* (1903), *The History of France* (1903), *A Class Book of English History* (1901; 3rd ed. 1902), *European History Chronologically Arranged* (1897; 2nd ed. 1902), *Handbook of European History* (1902), and *The Tudor Dynasty* (1904). He has edited the *Historical Introductions to the Rolls Series* (1902) and *Lectures on European History* (1904), both by Dr. Stubbs.

Hassall, ARTHUR HILL (1817-94), English physician and sanitarian; wrote reports in the *Lancet* (1851-4), which led to the passing of anti-adulteration acts and the appointment of public analysts; conducted investigations during the cholera epidemic of 1853-4, during which he observed the organism 'comma' bacillus, long afterwards described by Koch; and in 1868 founded the consumption hospital at Ventnor, advocating much of the open-air

treatment now in vogue. He was author of *A History of the British Fresh-water Algae* (1845), *The Microscopic Anatomy of the Human Body* (1849), *Food and its Adulterations* (1855), etc. See his *Narrative of a Busy Life* (1893).

Hassall, JOHN (1868), English artist, was educated at Newton Abbot, Devon, and at Heidelberg, and studied in Antwerp and Paris. He started as a farmer in Manitoba, but quickly took up his special line of illustration work—posters, book covers, and children's books. His work is distinguished by vigour and spontaneity, facile and correct draughtsmanship, a ready flow of invention, and a keen sense of humour free from coarseness.

Hassan (625-669) and **Hussein** (629-680), or **HOSEIN**, sons of Ali and Mohammed's daughter Fatima. Hassan was proclaimed caliph at Kufa on the death of his father in 660, but made terms with his rival, Moawiya, and retired to live a peaceful and religious life at Medina. He is said to have been poisoned by one of his wives in 669. His brother Hussein, of a more warlike temper, succeeded him as imam of the Shiites, and claimed the reversion of the caliphate. He was put to death by Moawiya's troops at Kerbela in 680. The Shiites have a profound veneration for them, and celebrate their 'martyrdom' annually with a dramatic representation of it, or passion play, and great solemnities. See Sir Lewis Pelly's *The Miracle-play of Hasan and Hosein* (1879); Matthew Arnold's 'A Persian Passion Play,' in *Essays in Criticism* (3rd ed. 1875).

Hassan-ben-Sabah (1054-1124), 'The Old Man of the Mountain,' founder of the sect of the Assassins. Being compelled to fly from the Persian court, he settled among the Ismaili in Syria, and learned their secret doctrines. Returning to Persia, he gathered an army, took the fortress of Alamut, and terrorized a good part of Persia and Syria. His followers, the Hashishim (whence 'assassins'), or 'hemp-eaters,' advocated secret assassination, but resembled the Ismaili in the speculative nature of their doctrines. See *ASSASSINS*.

Hasse, JOHANN ADOLF (1699-1783), German dramatic composer, was born at Bergedorf, near Hamburg. At eighteen he was engaged as a tenor singer in the Hamburg opera, and subsequently at the Brunswick Theatre, where his first opera, *Antigonus*, was produced (1724). After studying in Italy, he achieved great success by his opera *Sesostriato*, performed at Naples in 1726. In 1727 he became professor at the conservatory of the Incura-

bili at Venice. In 1728 he produced *Attalo, Re di Bitinia* at Naples, and the following year married the famous singer, Faustina Bordoni, and with her went to Dresden in 1731, where he was appointed music director and director of the opera. Two years later he came to London to conduct the opera established in opposition to Handel, and there he produced *Artaserse*, which met with a brilliant reception. He returned to Dresden in 1739, and remained there till 1763, when he withdrew to Vienna. He died at Venice. Among his other great works are the operas, *Alessandro nell' Indie* (1731), *Armínio*, and *Ruggiero* (1774). Hasse was possessed of an inexhaustible flow of pleasing melody, and his symphonies are especially charming.

Hasselt, chief tn. of the Belgian prov. of Limburg, on the l. bk. of the Domer, 19 m. from Maastricht; has distilleries. Here the Dutch defeated the Belgians (Aug. 6, 1861). Pop. (1900) 7,658.

Hassert, ERNST EMIL KURT (1868), German geographer, born at Naumburg on Saale; is professor of commercial geography at the commercial high school at Cologne. Chief works: *Die Nordpolargrenze* (1891); *Reise durch Montenegro* (1893); *Beiträge zur Physische Geographie von Montenegro* (1895); *Deutschlands Kolonien* (1899-1902); *Bericht über die neuere Litteratur zur deutschen Landeskunde* (1901), with Dr. A. Kirchhoff; *Polarforschung* (1902); *Landeskunde der Königsreichs Württemberg* (1902).

Hastinapur, ruined city in United Provinces, India, 22 m. E. of Meerut. Once the capital of the Pandava kingdom, it is celebrated in the *Mahābhārata*.

Hastings, BATTLE OF. On Sept. 28, 1066, William, Duke of Normandy, landed at Pevensey Bay to enforce his claim to the English crown. The English king, Harold, took up a strong position on the hill of Senlac to dispute William's advance. On the morning of October 14 the Normans attacked Harold's position, but were repeatedly driven back, and at one time it was supposed their duke had fallen. At length, by a feigned flight, William drew the English from their stockade, which was attacked on the flanks, and the position carried. Harold fell on the spot where the high altar of Battle Abbey afterwards stood.

Hastings. (1.) Parliamentary, munic., and co. bor., Cinque Port, and seaside resort, in Sussex, England, on the English Channel, 60 m. E.S.E. of London. The old town is chiefly inhabited by fishermen; the new town, on rising ground, stretches w. to St. Leonards—the two now forming one borough,

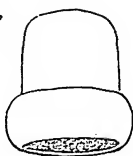
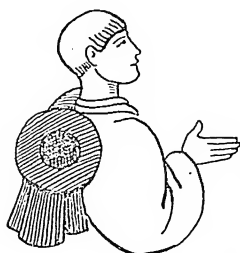
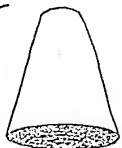
fronted by parades along the shore for about three miles. There are two large piers and several pleasure grounds, including the Alexandra Park. In the vicinity are interesting caves. The churches of All Saints and St. Clements date respectively from the 11th and 13th centuries, and on West Hill are the ruins of the castle built by William the Conqueror; of this the dungeons were discovered in 1894. Hastings returns one member to the House of Commons. Pop. (1901) munic. bor. 65,528; parl. bor. 62,913. (2.) City, Nebraska, U.S.A., co. seat of Adams co., 95 m. w. of Lincoln; trades in grain, and has flour-milling and wagon-making industries. Pop. (1900) 7,188. (3.) Town, 12 m. S.S.W. of Napier, in N. Island, N.Z., with refrigerating and gelatin works. Pop. (1901) 3,650.

Hastings, FRANCIS RAWDON (1754-1826), first Marquis of Hastings and second Earl of Moira, English general and administrator. He went to America in 1773, and was present at Bunker Hill. He was captured (1781) by a French cruiser on his homeward voyage, but was released by exchange of prisoners. He was dispatched to Holland with 7,000 men to reinforce the Duke of York (1794). Appointed in 1812 governor-general of Bengal and commander-in-chief of India, his rule opened with two campaigns against Nepal; he crushed the Pindaris, and by his defeat of the chief of Nagpur and Holkar, secured for Britain supremacy and extension of territory. For these services he was created Marquis of Hastings (1817). See Prinsep's *History... of India during the Administration of the Marquess of Hastings* (1825).

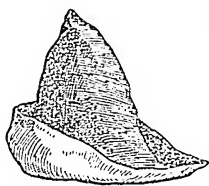
Hastings, WARREN (1732-1818), English administrator, was born at Churchill, Oxfordshire, of the old but impoverished family of Hastings of Daylesford. His parents dying soon after his birth, Hastings passed his earlier years with his grandfather, Penyston Hastings, the rector of Daylesford. In 1740 his education was undertaken by his uncle, Howard Hastings, who sent him to Westminster, where he proved a brilliant scholar and a general favourite. In 1750, his uncle having died, his guardian sent him out to Calcutta as a writer in the East India Company's service. Fourteen years later he returned to England, with only a moderate fortune, notwithstanding the great temptations to enrich himself afforded by his position. Evidence given by him on Indian affairs before a committee of the House of Commons (1766) attracted the notice of the directors of the East India Company, and in 1769 he returned to India as a

member of the Council of Madras—a post exchanged in 1772 for the governorship of Bengal. Meanwhile the affairs of the company had come under the consideration of Parliament, and the Regulating Act of 1773 was passed, by which the council was reduced to four members and a governor-general. Hastings was named in the act as governor-general for a period of five years. To the genius and foresight of Warren Hastings is due the consolidation of our Indian empire. Incursions of Rohilla hordes from the north followed the decay of the Mogul power; in the south the fires of French ambition still smouldered; while the successors of the great Sivaji yet dreamt of Maratha dominion. Bombay and Madras were saved, the Marathas checked, Rohilkhand conquered, and the hopes of the French extinguished. On his return to England in 1786 Hastings was received with distinction by George III., and the directors of the East India Company acknowledged his services by a unanimous vote of thanks. But the Whig opposition vehemently denounced his conduct of Indian affairs, and succeeded in carrying in the House of Commons a motion for his impeachment. The trial began in Westminster Hall on Feb. 12, 1788, the leaders of the impeachment being Burke, Fox, Sheridan, Windham, and Grey. Hastings was acquitted; but the trial, which had extended over seven years, cost him £70,000—the bulk of his fortune. The company, however, came generously to his aid by granting him a pension. Before his death the tide had turned, and the popular voice testified to the value of his services to the empire. He founded the Asiatic Society of Bengal in 1784. See *INDIA—History*; also Sir Alfred Lyall's *Warren Hastings* (1889), Malletson's *Life of Warren Hastings* (1894), Gleig's *Memoirs of the Life of Warren Hastings* (3 vols. 1841), Lawson's *Private Life of Warren Hastings* (1895), *Letters of Warren Hastings to his Wife*, ed. by Grier (1905), and Macaulay's *Essay*, although this last is somewhat biased.

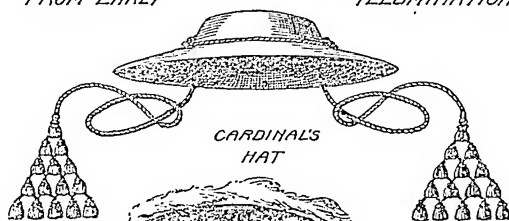
Hastings Beds, in geology, the lowest members of the Wealden series, lie at the base of the Cretaceous system of the south of England. They are fossiliferous, containing fresh-water shells and bones of reptiles and fishes; are well seen on the shore near Hastings; and form an extensive area of country around Tunbridge Wells and Battle. The thickness of the whole group is from 600 to 1,000 ft. Irenstone occurs in the Wadhurst clay, and was formerly worked by means of shallow, bell-shaped pits.



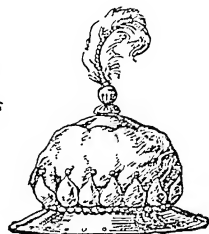
HATS OF XIII & XIV CENTE
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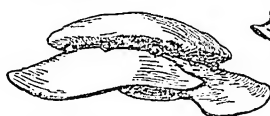
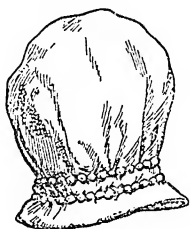
HENRY IV



CARDINAL'S
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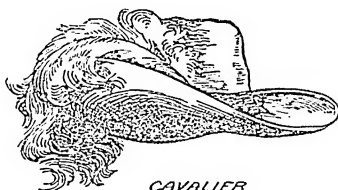
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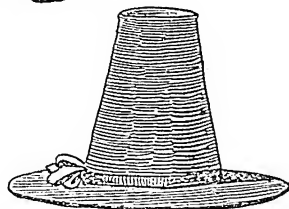
SIXTEENTH CENTURY HATS



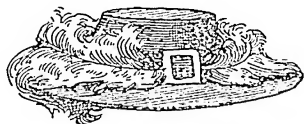
CHAPEAU HENRI QUATRE



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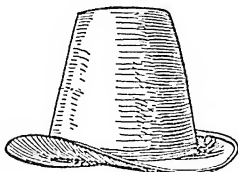
CHARLES II.



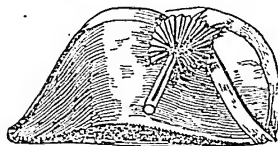
MILITARY COCKED HAT



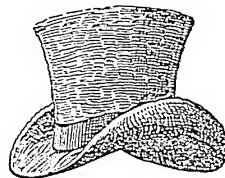
COCKED HAT



WHITE BEAVER



NAVAL COCKED HAT



BEAVER

Hat. A cap of classic origin (Phrygian bonnet), probably made of the fur of some animal, was worn in Anglo-Saxon times; but the hat of to-day, identified by the brim, derives its origin from the *petasus* of the Greek, worn when on his travels. Under the Normans (Henry I.) the hood, copied even in armour, still prevailed, and the cap had developed a peak, precursor of the brim. In the 13th century (Henry III. and Edward I.) the Greek model and custom of slinging the hat over the shoulder behind ready for use, also cap with chin-band, are alike notable. Pope Innocent IV. introduced the cardinal's hat. In the next century (Richard II.) feathers and fantastic cloth ornaments were worn in broad-brimmed hats; then we have the 'Flanders beaver' of Chaucer's merchant. During the wars of the Roses peaked hats of the modern 'brigand' style, sometimes nearer to the 'wideawake,' and again turned up at the back and sides, with a single feather held by a costly clasp in front, were typical of the time. The Tudor bonnet of velvet and satin came in with Henry VII., but broad brims and feathers were also worn. Henry VIII.'s hat was of black velvet and low crowned; and from the reformation dates the collogo cap, stiffer and less attractive in its present form. The head-gear of Elizabeth's reign was so varied as to provoke adverse criticism in the *Anatomic of Abuses* (1585). Chapeau Henri Quatre, introduced into France by the Ligue, reached England under James I., and spread out into the Cavalier sombrero of Vandyke, to be afterwards contracted into the wideawake. The Puritans affected a high crown and stiff brim, not so broad; whilst Charles II. over-emphasized in size and ornament the Cavalier head-dress. The looping-up in different 'cocks'—e.g. 'Monmouth'—of the broad brims gradually developed the 'cocked hat' of the 18th century, which passed away with the revolution (1789). Wigs rendered hats more ornamental than useful, and the 'macaroni' toy hat, poised on a two-foot structure of hair, was the silliest of British types (1775). Carried for show, the 'pretty black beaver tucked under the arm' was very costly, but continued to be full-dress costume even when the bell-shaped beaver came in under the prince-regent (1811-20). The tall silk hat, brought from Florence to France, and thence (1840) to England, 'first worn by John Hetherington, haberdasher in the Strand,' has since reigned an unlovely victor. Quaker hats; Nivernois, small flaps and flat crown;

Wellington, with yeoman crown; Angelsea, with bell-shaped crown; D'Orsay, with ribbed silk binding and large bow; Earl of Harrington, with queer, square brim; very many—Kossuth, Stanley, High Church, Low Church, artist, billycock, tennis, opera—are all varieties past or present. The Prince Consort wore light soft felt hats; and this, beaver, and silk form the three types principally worn at the present day, and are made in France (Anduze, Lyons, Paris), England (Manchester district), and United States (New York), in their most perfect form. Straw hats come from Bedford, Tuscany, and Canton. Panama hats, once sold for £20 apiece, are now commonplace.

Manufacture.—Silk-hat manufacture consists of five distinct operations, technically known as 'body-making,' 'crown-sewing,' 'finishing,' 'shaping,' and 'trimming,' performed in the sequence enumerated. The first three are the work of men, the last two of women. The 'body' is made of specially bleached calicoes and muslins, stiffened with a solution of shellac, and is described in four parts, 'tip' and 'side crown,' 'topside' and 'under' (of brim). On the block the body is constructed of several layers of the proofed material, first dry, then wet; and the brim, prepared separately, is ironed on after the crown is made. The block being removed, it is ready for the plush covering, woven and dyed chiefly at Lyons and Metz. It is then finished by ironing, alternating with 'dumming,' shaped with a hot iron and curling machine, hand-moulded to its final shape, trimmed, lined, and polished for sale. For the manufacture of straw hats see STRAW.

Opera Hats.—The essential part is a metallic mechanical frame which can be extended or closed at will. The brim and tip are composed of proofed calico, as in silk hats. Merino, corded silk, or satin is used for covering.

Felt Hats.—Bodies are of two kinds, fur (beaver, coney, rabbit), and wool of various qualities. Fur, cleansed in a 'picker,' passed through a 'former,' drawn on a cone, sprayed with hot water till cohesive, is removed, retaining its shape, and hardened. The wool body, differently treated at first, undergoes the same final processes of proofing, steaming, dyeing, blocking, pressing in an iron mould, finishing, and shaping. Goods are then brimmed and packed. See Georgiana Hill's *History of English Dress* (1893); Fairholt's *Costume in England* (3rd ed. 1885); Wingfield's *Civil Costume in England* (1884); Planché's *Hist. of British Costume* (3rd ed. 1874).

Hatch, EDWIN (1835-89), English theologian, born at Derby. After teaching classes at Trinity College, Toronto, he returned to Oxford as vice-principal of St. Mary's Hall (1867-85). The living of Purleigh, Essex, was conferred upon him in 1883, and he became university reader in ecclesiastical history (1884). Hatch was the first editor of the Oxford *Official Gazette* and the *Student's Handbook*. He is best known for his treatises, *On the Organization of the Early Christian Churches* (Bampton Lectures, 1880), and *The Influence of Greek Ideas upon the Christian Church* (Hibbert Lectures, 1888), in which he reveals himself as an independent but fair-minded thinker. **Hatchment.** See ACHIEVEMENT.

Hatfield, or BISHOP'S HATFIELD, mkt. tn., Herts, England, on the Lea, 20 m. N. of London. The town adjoins Hatfield Park, the seat of the Cecils, Earls of Salisbury. Hatfield House, a fine specimen of Jacobean architecture, contains relics of Tudor times, such as the Casket Letters of Mary Queen of Scots. Edward VI. and Elizabeth were both residing there when called to the throne. Pop. (1901) 7,551.

Hatfield Chase, peat-moss moor between the rivers Don, Idle, and Torne, adjoining Hatfield village, Yorks, England. The chase was drained by Vermuijden, a Dutch engineer (1649-53). See John Tomlinson's *The Level of Hatfield Chase* (1882).

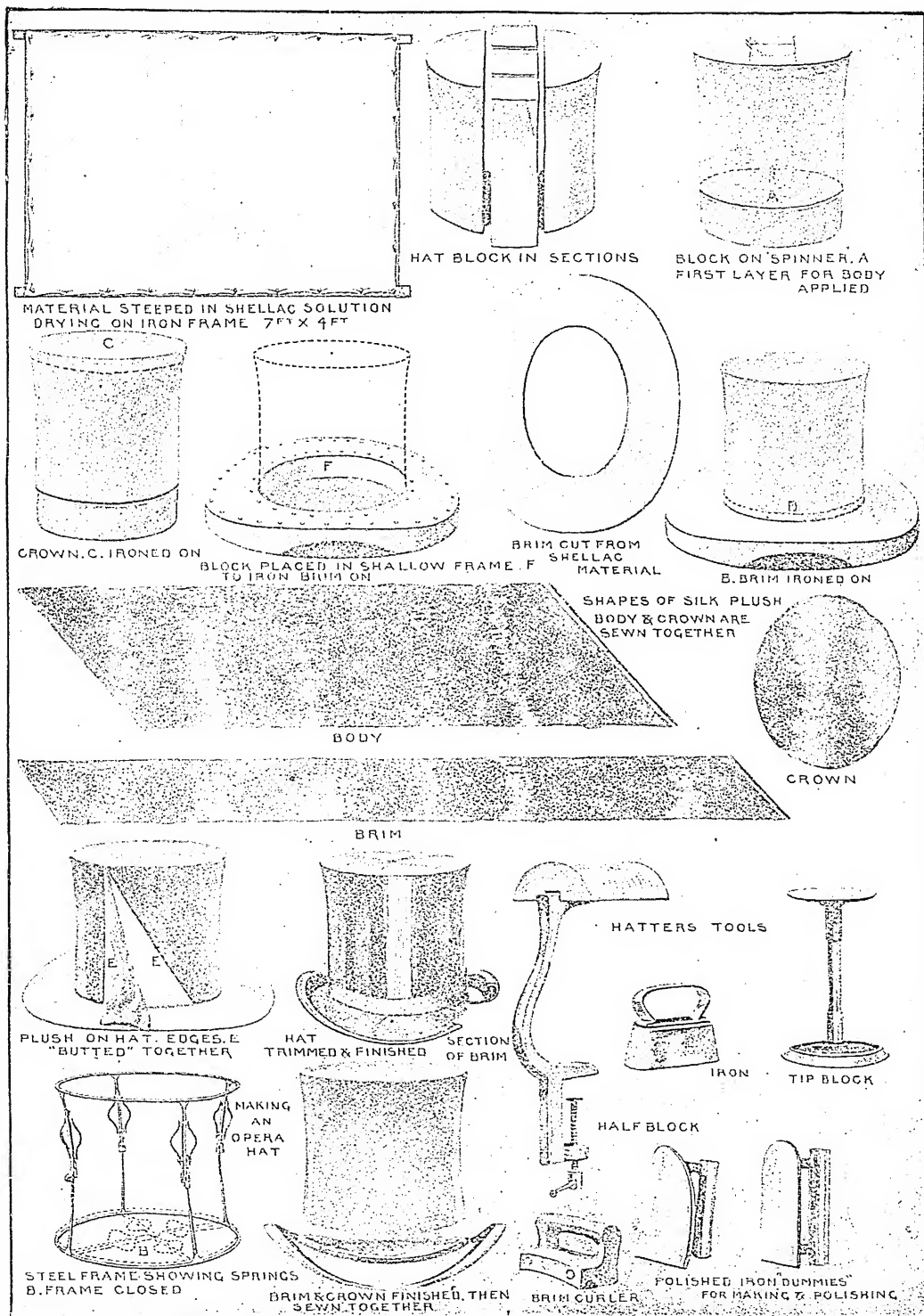
Hathaway, ANNE (1556-1623), wife of Shakespeare.

Hatherley, WILLIAM PAGE WOOD, BARON (1801-81). Lord Chancellor of England, born in London; was called to the bar (1827), and became q.c. (1845). He entered Parliament as M.P. for Oxford (1847); became solicitor-general (1851), subsequently lord-justice of appeal (1868), and, in the same year, lord chancellor. He had a large practice in the Chancery Court, and introduced reforms in legal procedure. He wrote *Truth and its Counterfeits* (1857), *The Continuity of Scripture* (1867-9), etc. See Stephens's *Memoir* (1883; rev. ed. 1902).

Hathor. See ATHOR.

Hathras, tn., Aligarh dist. (Doab), United Provinces, India, commercial centre, with an export trade in sugar, grain, and oil seeds. Pop. (1901) 42,578.

Hatia, isl., Noakhali dist., Bengal, India, at the Meghna mouth of the Ganges. A low-lying island, it has been swept by destructive storm-waves. In the cyclone of Oct. 31, 1876, it was completely submerged, and 30,000 people perished. Area, 185 sq. m.



Hat Manufacture.

Hatien, tn., Cochín-China, French Indo-China, 155 m. w.s.w. of Saigon, on the coast of the Gulf of Siam. Fishing and the cultivation of pepper are the chief industries. Pop. (1894) 10,465.

Hatim et-T'ai, an Arab chief who lived shortly before the time of Mohammed. His greatness of soul and wonderful liberality have long been the theme of Oriental poets and writers.

Hats and Caps, names given to two political parties in Sweden (1737-72). The Hats, under Tessin, came into power in 1738, and remained supreme for twenty-seven years. The Caps succeeded them in 1766, were overthrown in 1769, but recovered power in 1771. Both parties were abolished by Gustavus III.

Hatshepsu, or **HATSHEPSUT**, ancient Egyptian queen, of the 18th dynasty, daughter of Thothmes (Tahutmes) I., and wife and co-regent of Thothmes II., reigned about 1500 B.C. She sent a fleet to explore the Somali-land coast (Punt). Her tomb was discovered at Thebes in 1904.

Hatteras, Cape, cape at the extremity of a low sandbank, N. Carolina, U.S.A. It is separated from the mainland by Pamlico Sound. Violent storms occur, and the coast is dangerous.

Hattin, vil., Palestine, 5½ m. n.w. of Tiberias; was the scene of the defeat of the crusaders by Saladin in 1187.

Hattingen, old tn., Prussian prov. of Westphalia, 9 m. by rail s.e. of Essen. Pop. (1900) 8,973.

Hatto, archbishop of Mainz. Two Hattos have been more or less confused in the chronicles. **HATTO I.** (c. 850-913) was appointed abbot of Richenau (888) and archbishop of Mainz (891). He is sometimes stated to have been devoured by rats for scoffingly comparing the cry of the poor to the squeak of mice. But the legend is more generally applied to **HATTO II.** (d. 970), who was abbot of St. Boniface in 942, and afterwards archbishop of Mainz (968), and imperial councillor; and the rat legend points to a reputation for oppression of the poor. It probably grew out of the corruption of the name *Mause-thurm* (toll-tower) into *Mäuse-thurm* (mouse-tower) in the Rhine at Bingen. See Heidemann's *Hatto I.* (1865); Baring-Gould's *Curious Myths of the Middle Ages* (1869); Max Beheim's *Die Mause-thurm Sage* (1888); *Der Würzburger Chronik*, ed. Bucholz (1879); *Annales Francorum Fuldensis*, in *Ger. Rerum Scriptores* (vol. i. 1600); and Nauber's *Hatto, Bischof von Mainz* (1789).

Hatton, JOHN LIPTRÖT (1809-86), English musical composer, born at Liverpool, became musical

director of the Princess Theatre, London. He was also first conductor of the ballad concerts (St. James's Hall); produced nearly three hundred songs, of which some had remarkable vogue—*Simon the Cellarer*, *Good-bye, Sweetheart*, *good-bye*, and *To Anthea* being among the best. He also wrote an operetta, *The Queen of the Thames* (1843), *Pascal Bruno* (1844), an opera, and other works of some ambition.

Hatton, JOSEPH (1841), English novelist and journalist, born at Andover. He was special correspondent in Europe for the *New York Times* and the *Sydney Morning Herald*. Associated with the *Standard* and *Daily Telegraph*, he visited the United States and Canada in 1876; later investigated the Irish question; and arranged for a system of daily cables of American news for the *Standard*. *Bitter Sweets*, his first book (1865), has been followed by *Clytie* (1874), *The New Ceylon* (1881), *By Order of the Czar*—condemned by Russian censor (1890), *When Greece meets Greece* (1895), *In Male Attire* (1900), and *A Vision of Beauty* (1901).

Hatvan, tn., co. Heves, Hungary, 43 m. n.e. of Budapest; grows water melons and manufactures sugar. Pop. (1900) 9,698.

Hatzfeld, or **ZSOMBOLYA**, mkt. tn., Hungary, 25 m. w. of Temesvár. It is the chief settlement of the Swabians of south Hungary. Pop. (1900) 10,138.

Hatzfeldt-Wildenbourg, PAUL, COUNT VON (1831-1901), German diplomatist, born at Düsseldorf. After holding several diplomatic posts, he was appointed secretary for foreign affairs (1883), and in 1888 German ambassador at the court of St. James, an office which he held till his death. Count Hatzfeldt played an important part in the national awakening under Prince Bismarck, with whom he was a great favourite. See *The Hatzfeldt Letters* (1905).

Hauberk, an accoutrement originally intended as defensive armour for the neck; but even at the end of the 12th century it had developed into a tunic of chain-mail. The name was also applied in the Chaucerian period, together with its cognate, *haubergeon*, to describe a garment worn as a penance.

Haubourdin, tn., dep. Nord, France, 4 m. s.w. of Lille; has sugar and starch factories, breweries, cotton and flax spinning. Pop. (1901) 8,485.

Hauch, JOHANNES CARSTEN (1790-1872), Danish poet, born at Frederikshald (Norway); became professor of Scandinavian literature at Kiel (1846), and professor of aesthetics at Copenhagen (1851). Most of his tragedies

are distinguished by vigorous characterization and vivid historical colour. The chief of them are *Bajazet*, *Tiberius*, *Gregorius VII.*, and *Don Juan*, united in the collection *Dramatiske Værker* (1828-9), followed by *Søstrene paa Kinnekullen* (1849), *Marck Stig* (1850), and *Tycho Brahes Ungdom* (1852). His fairy poem *Hamadryaden* (1830) is one of the first productions of the Danish romantic school. He is also the author of a beautiful collection of poems, *Lyriske Digte* (1842), and of justly admired romances—e.g. *Vilhelm Zavern* (1834), *Guldmageren* (1836), and *Robert Fulton* (1853). He also published *Minder fra mit Barndom og mit Ungdom* (1867), and *Minder om min første Udenlandsreise* (1871).

Hauff, WILHELM (1802-27), German author, born and died at Stuttgart. Although only twenty-five years of age when he died, he had written *märchen* or fairy tales, poems (*Reiters Morgenbesang*, *Soldatenmuth*), one novel (*Lichtenstein*), a few short stories (e.g. *Die Bettlerin vom Pont des Arts*, *Das Bild des Kaisers*), and a playful fantasy (*Phantasien im Bremer Ratskeller*—Eng. trans. 1889), which have gained an enduring place in German literature. *Lichtenstein* (1826; Eng. trans. 1859) exhibits the influence of Scott's historical novels. Hauff also showed promise in the field of satirical humour (*Memoiren des Satans*). See Gustav Schwab's *Hauff's Sämmtliche Werke*, with biography (5 vols., several eds.); also new edition of *Werke* by Flaichen (1890, etc.).

Haugesund, tn., Stavanger co., Norway, on E. side of Karmsund, 40 m. n.w. of Stavanger, with herring-fishing. Pop. (1900) 7,935.

Haubowline, isl. in Cork harbour, Ireland, ½ m. s. of Queens-town. It is fortified, and has artillery barracks and various ordnance works.

Hauptmann, GERHARD (1862), German dramatist, was born at Salzbrunn in Silesia. He began his career as a disciple of Ibsen and the 'naturalists' in 1889, with a study of social life entitled *Vor Sonnenaufgang*. This was followed by *Friedensfest* (1890); *Einsame Menschen* (1891), his first real success; the comedy *Kollege Crampton* (1892); *Die Weber* (1892), a study of the wretched conditions of life obtaining amongst the hand-weavers of the Silesian mountains; a comedy, *Der Biberpelz* (1893), and its continuation, *Der rote Hahn* (1901); *Fuhrmanns Henschel* (1898); a comedy, *Schluck und Jan* (1900); and the tragedies *Michael Krammer* (1900), *Rose Bernd* (1903), and *Elga* (1905). Strictly speaking, his books are not plays, but novels cast in a

dramatic form; narrative predominates, action is almost entirely absent. Hauptmann succeeds better when he turns to the naïve world of child-life and the *märchen*. To this genre belong his most popular books, *Hanneles Traumfahrt* (1893), *Die Versunkene Glocke* (1896), and *Und Pippa tanzt* (1903). In 1902 he published *Der arme Heinrich*, adapted from Hartmann von der Aue. See P. Schlenker's *G. Hauptmann* (1898).

by way of the Jordan. In Ezek. 47: 16-18 it denotes the fine agricultural plain forming the E. part of Bashan.

Haureau, JEAN BARTHÉLEMY (1812-96), French historian, born in Paris; for some years edited the *Courrier de la Sarthe*, and in 1845 joined the staff of the *Nationale*, later being appointed keeper of manuscripts at the National Library in Paris (1849-51), and director of the national



Royal Niger Hausas.

(Photo by Gregory.)

Hauptur. See HAPUR.
Hauran (anc. *Auranitis*), dist., Syria, E. of Jordan. The name is applied to (a) Hauran proper—Jedur, Jaulan, and part of the hill country s. of the Yarmuk; and (b) the district extending E. of Jaulan to the desert, and from the district of Damascus to the Yarmuk. By means of the Damascus-Mezerib and the Damascus-Beirut Rys. it has connection with the sea, and another line is approaching it from Haifa

printing office (1870-82). Among his works are *François I. et sa Cour* (1850); *Charlemagne et sa Cour* (1854); *Histoire de la Philosophie Scolastique* (1872-81), his best-known work; and *Histoire Littéraire du Maine* (10 vols. 1870-7).

Hausa Association, a society established in 1892 to promote the study of the Hausa language. It has endowed a Hausa lectureship at Cambridge for three years.

Hausas, or **HOUSSAS**, W. African race, in British Nigeria. Their language, a variety of the Hamitic group, but with a strong Semitic tinge, is 'a sort of *lingua franca* in Central and W. Sudan, between Lake Chad and the Niger. Of medium height and black complexion, they represent the highest negro type, and have long had a native civilization. They have a written character, a modified form of Arabic writing, and their literature includes poems, ethical sayings, legal documents, and history. They teach their children to read and write. Many of them hold the faith of Islam, formerly imposed upon them by the Fulahs, but their earlier heathenism still survives. For generations they have mined iron, tin, silver, lead, and salt; and they are excellent farmers, conspicuous as traders, and experts in cotton-spinning, weaving, and dyeing. Although naturally peaceful, they are admirable soldiers, being distinguished not only by great physical strength, but by coolness and bravery in action. As early as 1874 they fought as allies of the British (in the Ashanti campaign). See C. H. Robinson's *Hausaland* (1896 and 1903), *Nigeria* (1900), *Dictionary of Hausa Language* (with W. H. Brooks, 1901), and *Hausa Grammar* (new ed. 1905); and Merrick's *Hausa Proverbs* (1905).

Haussmann, GEORGES EUGÈNE, BARON (1809-91), prefect of the Seine and the builder of modern Paris, was born in that city. From 1849-51 he was prefect of Var, Yonne, and Gironde successively, and in 1853 Louis Napoleon made him prefect of the Seine. From that time he devoted his attention to a scheme for the improvement of Paris, which has literally transformed the city; but the cost, being £34,000,000, gave rise to severe strictures on the part of the Corps Législatif, and in 1870 Haussmann was forced to resign. See *Mémoires* (3 vols. 1890-3).

Hautbois. See OBOE.

Haute-Garonne, dep. of southern France, extending along the upper Garonne. In general it is narrow, from 6 to 60 m.; the area is estimated at 2,458 sq. m. In the southern mountainous district there are numerous mineral springs, and in the neighbourhood of St. Bât very superior white marble is quarried. The valley of the Garonne is very fertile. Toulouse is the capital. Pop. (1901) 448,481.

Haute-Loire, dep. in S.E. of France. Its area is 1,930 sq. m. The Monts du Velay divide the department into two sections. The E. half is a plateau (2,000-3,000 ft.), through which the Loire cuts its way; the W. half

is more deeply trenched by the valleys of the Allier basin. Indications of volcanic activity are frequent. Mineral springs are numerous; but, after coal, antimony is the only mineral of importance, the department supplying half the total produce of France. The vine is grown, and good horses are reared. Cap. Le Puy. Pop. (1901) 314,038.

Haute-Marne, dep. in E. of France, divided by the north-flowing Marne. It has an area of 2,420 sq. m. The s. part is occupied by the Plateau de Langres, the gathering ground of the Marne and Meuse, of tributaries of the Saône-Rhône basin, and of others of the Seine basin. The central part of the department is the Barrois and the Bassigny; the N. the Vallage; and the extreme N.E. the Perthois, the only fertile district. The only industrial centre is St. Dizier, around which much iron ore is mined and worked up in the town. Forests cover one-fourth of the surface. Wine is grown. Hunting and fishing are good. Cap. Chaumont. Pop. (1901) 226,545.

Haute-Saône, dep. in E. of France. Area, 2,075 sq. m. The upper Saône winds s.w. through the dep. from the Vosges in the N. The Oignon has its source in the E., and forms the greater part of the s. boundary till it joins the Saône. Haute-Saône is a calcareous plateau between the sandstones of the Vosges and the characteristic Jura formations. A large part of the surface is under forest, and there are some very fertile districts, but on the whole agriculture is not in a very flourishing state. Cotton-spinning is a leading industry in the E., and coal is mined around Ronchamp. Cap. Vesoul. Pop. (1901) 266,605.

Haute-Savoie, dep. of E. France. It forms part of the s. shore of the Lake of Geneva. The Mont Blanc range, on s.e., separates the department from the Italian Po valley. On the w. the Rhone marks the boundary up to a few miles from Geneva. In the N.E. is the Chablais, or basin of the Drance, flowing into the Léman, 2 m. E. of Thonon; this district is especially renowned for its white wine. In the s.e. and centre is Faucigny, the basin of the Arve, collecting from the glaciers of Mont Blanc. The tourist resorts of Chamonix, St. Gervais, and Sallanches are on the Arve, which joins the Rhone at La Jonction, near Geneva. The climate ranges from the perpetual snow of the lofty peaks to the perennial mildness of Evian. There is little agriculture, no mining, and industry is limited. Cap. Annecy. Area, 1,775 sq. m. Pop. (1901) 263,803.

Haute-Vienne, dep. of S.W. France. Area, 2,120 sq. m. A small part drains s.w. to the Dordogne, but the greater part is watered by the Vienne and its tributaries. The surface is diversified by mountains of low elevation—the mountains of Limousin in the s., Blond in the w., and Ambazac in the N. The soil is poor. Cattle are reared in the meadowlands, which occupy about one-third of the department. Chestnuts are largely grown, and form a staple food of the peasantry. St. Yrieix, in the extreme s., supplies the kaolin for the Limoges china factory. Cap. Limoges. Pop. (1901) 381,753.

Hautes-Alpes, dep. in s.e. of France, on the Italian frontier. Area, 2,178 sq. m. The E. boundary runs along the upper Durance, the highest summit here being Mont Pelvoux (13,460 ft.). The chief river is the Durance. The depression in which Gap, the capital, lies is drained by the Drac to the Isère and the Buech to the Durance. The lower valleys of the Buech and the Durance have vegetation of the Mediterranean character. The Hautes-Alpes have been almost denuded of trees, and during the summer form the grazing ground of large herds of cattle and merino sheep. Argentiferous lead, marble, and anthracite are the only minerals of importance. Pop. (1901) 109,510.

Hautes-Pyrénées, dep. of S.W. France. It has an area of 1,749 sq. m. The district abutting upon Spain belongs to the basins of the Adour and the Garonne. The valley of the Gave de Pau, a tributary of the Adour, occupies a third of the department. The chief summit in this part is the Vignemale (10,820 ft.), the loftiest peak of the Pyrenees in France. The valley of Cautelets is in the same district. The valley of the Neste occupies the s.e. part. On the N.E. is the Plateau de Lannemezan, also known as Nébouzan and Magusac. The Adour takes its rise in the department a few miles E. of the Pic du Midi de Bigorre (9,440 ft.), and drains the centre and N.W. of the department. The Plaine de Tarbes is a fertile district, productive in grain. The region of high plains and low mountains from the Gave to the Neste is known as the Bigorre. The soil is rich in minerals, but only lead, zinc, and magnesium, slate and marble, are worked. The department is famous for horses. Cap. Tarbes. Pop. (1901) 215,546.

Hautmont, tn., dep. Nord, France, on the Sambre and canal, 18 m. s.e. of Valenciennes; has breweries, foundries, and sugar refineries. Pop. (1901) 12,858.

Haut-Rhin. See BELFORT.

Haüy, RENÉ JUST (1742-1822), French physicist and mineralogist, was born in Picardy; was a teacher at the college of Navarre (1764); discovered the geometrical law of crystallization (1781); and was elected to the Academy of Sciences (1783). He was afterwards curator in the School of Mines (1794), and professor at the museum of natural history. Haüy was the author of *Traité de Minéralogie* (1801); *Traité Élémentaire de Physique* (1803); *Traité des Caractères Physiques des Pierres Précieuses* (1817); *Traité de Cristallographie* (1822). See G. Cuvier's *Eloge Historique de Haüy* (1823).—His brother, VALENTIN HAÜY (1745-1822), was the inventor of methods for teaching the blind. He published *L'Éducation des Aveugles* (1786). See Strebitzky's *Valentin Haüy* (1884).

Haüyne, a complex calciumaluminium silicate which occurs in igneous rocks, particularly those rich in sodium. Under the microscope it is colourless or pale blue, isotropic, and frequently filled with minute enclosures of glass or minerals arranged in lines parallel to the faces of the crystal. Nosean and sodalite are very similar to haüyne in composition, properties, and mode of occurrence. Lapis lazuli is a member of the same group. Haüyne is found in the ejected blocks of Vesuvius, in certain volcanic rocks of Italy, and at the Lancher See, near Mainz.

Havana, cap. and chief city of Cuba, on the N. coast, in 23° 8' N. lat., 82° 22' W. long. It was founded about 1519, and occupies a low peninsula, with the sea on the N. and the harbour on the E. On the S. and W. it is backed by an amphitheatre of hills rising up to Morro castle across the bay, and on the heights behind the city is the Prince's Castle. The Tacon theatre is one of the largest theatres in the world. The principal church is the Merced, one of the alleged burial-places of Columbus. The disputed remains were lately removed to Spain. The principal educational institutions are the university and the Jesuit College de Belen. Havana is the centre of the tobacco industry and the chief port of the island. The exports consist chiefly of cigars, tobacco, and sugar. The harbour is a landlocked basin 3½ m. long. The highest temperature recorded in Havana for ten years was 100°. On Oct. 1, 1743, Rear-admiral Sir Charles Knowles engaged the Spanish Rear-admiral Spinola between Tortuga and Havana. All the Spaniards ultimately escaped into port except the *Conquistador*, which struck after a brave defence. The blowing up of the

United States battleship *Maine* in the harbour on Feb. 15, 1898, led to the Spanish-American war, in which the city and harbour were blockaded. (See further under CUBA.) Pop. (1899) 242,055, the foreign-born being 22 per cent.

Havant, par. and mrkt. tn., Hampshire, England, on Langston harbour, 6½ m. N.E. of Portsmouth. Brewing, malting, and tanning are the principal industries. Pop. (1901) 3,839.

Havas Agency, or more properly the AGENCE HAVAS, French news-distributing organization, had its beginnings when Charles Havas (1785-1858) was authorized by Napoleon to send dispatches from the general staff quarters to the newspapers of that time. But it was not till 1835 that the

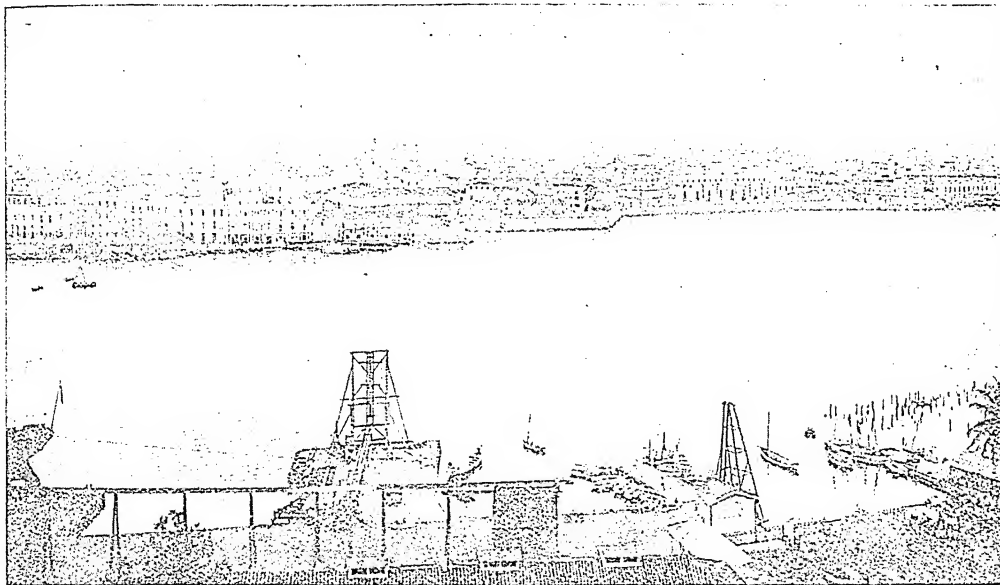
Havel, riv. of Prussia, rises in Mecklenburg, flows S. as far as Potsdam, being joined to the Spree at Spandau. It then proceeds W., and in the Plauer Lake, a little beyond Brandenburg, turns to the N.W., and finally joins the Elbe a few miles above Wittenberge, after a course of 220 m. The stream is navigable for 205 m. It is connected by canals with the Elbe and the Oder, and is itself in part canalized. Area of basin, 2,260 sq. m.

Havelberg, old tn., prov. Brandenburg, Prussia, on the Havel, 69 m. by rail N.W. of Berlin. From 946 to 1548 it was a bishop's see, and still preserves its cathedral (1140). Pop. (1900) 6,649.

Havelock, SIR HENRY (1795-1837), English soldier, born at

Havelock-Alan, SIR HENRY MARSHMAN (1830-97), British lieutenant-general, born in India, the eldest son of Sir Henry Havelock. During the Indian mutiny he did excellent work, receiving the Victoria Cross (1858), and on two occasions saving Outram's life. He was next engaged in the New Zealand war, and from 1874 to 1881 was M.P. for Sunderland. In 1880 he was elected M.P. for the south-eastern division of Durham (1885). During a visit to India he was shot by a Khaibari on the Afghanistan frontier.

Haverfordwest, munic. and co. bor., seapt., and mrkt. tn., Pembrokeshire, Wales, 6 m. N.N.E. of Milford; has coal mines. Haverfordwest has a lord-lieutenant of



Havana.

agency received anything like a definite organization. In that year Mr. Charles Havas, who was a translator of foreign languages, inaugurated at Paris a service of news, translated from the various foreign newspapers, which was supplied to journals for a monthly subscription. Soon afterwards he extended the scope of his operations by appointing correspondents in the chief towns of France and the principal cities abroad. At the same time he established a service of carrier pigeons. In 1879 the Agence Havas was converted into a company, with a capital of eight and a half million francs. The subscribers include not only newspapers, but also private individuals.

Bishop Wearmouth, Durham. He first saw active service in Burma (1825-6). In the Afghan campaign he was present at the storming of Ghazni and the occupation of Kabul in 1839; he served also in the Mahratta and Sikh wars and the Persian expedition. Ordered to relieve Cawnpur and Lucknow during the mutiny, he defeated the rebels at Fatehpur and Pandu Nadi on July 13, 1857, and seven days afterwards at Unao and Bashiratganj, and entered Lucknow, Sept. 25, 1857, in the residency of which he was himself besieged for nearly two months. There he died on November 24. He wrote *Narrative of the War in Afghanistan* (1840), and *Memoir of the Campaign in Ava* (1828). See Marshman's *Memoir* (1860).

its own. The town is said to owe its origin to the settlement of Flemings by Henry I. in 1107. Pop. (1901) 6,007.

Havergal, FRANCES RIDLEY (1836-79), English poetess (writer of hymns) and practical philanthropist, was born at Astley, Worcestershire, the daughter of the Rev. W. H. Havergal, whose *Psalmody* she edited (1870). Grace and sensitiveness to impressions from external nature, keen introspection, together with strong sympathy for sorrow and suffering, characterize almost everything she attempted—*Ministry of Song* (1870), *Under the Surface* (1874), *Loyal Responses* (1878), etc. Her poems were collected by her sister in 1884. See *Memoirs* by her sister (1880).

Haverhill. (1.) City, Essex co., Massachusetts, U.S.A., on the Merrimac R., 30 m. N. of Boston. It has a granite industry, and manufactures boots and shoes. Whittier the poet was born here. Pop. (1900) 37,175. (2.) Parish and mkt. tn., Suffolk and Essex, England, 7 m. w. of Clare; has manufactures of clothing, boots, shoes, silk for umbrella covers; also brick works and rope and twine factories. Pop. (1901) 4,862.

Havers, CLOPTON (c. 1655-1702), British physician and anatomist, was a doctor in London. He gave special attention to anatomy, embodying his ideas in *Osteologia Nova, or Some New Observations of the Bones* (1691). This work was the earliest accurate description of the structure

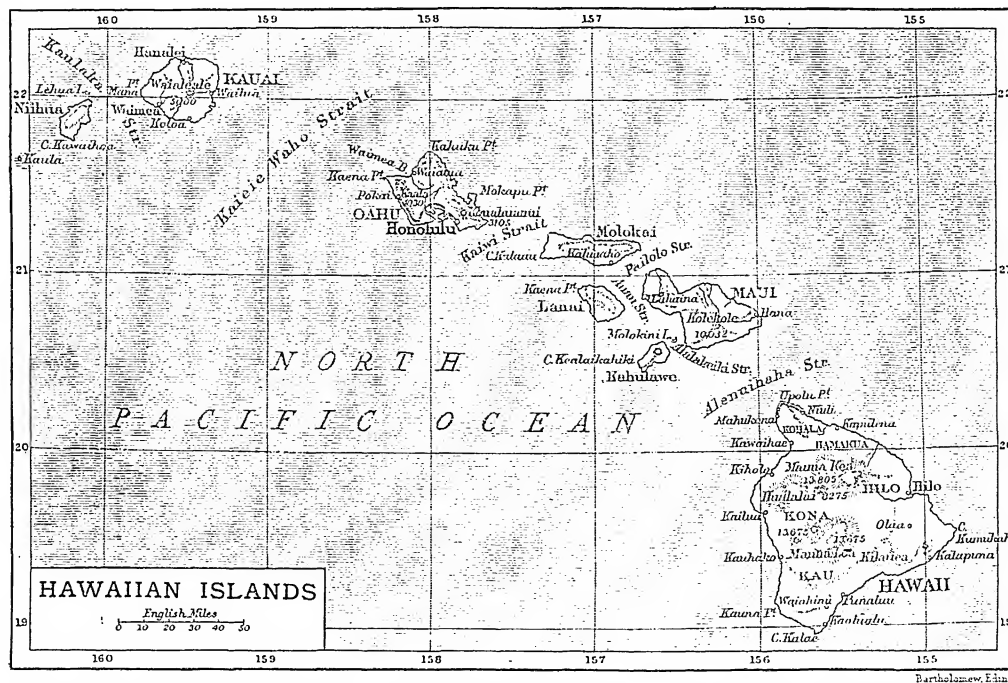
and in Missouri. He also built the Mint at Philadelphia. With Hugh Bridport he published the *Builders' Assistant* (3 vols. 1818).

Havildar, a non-commissioned officer attached to native regiments of infantry in India. The rank nearly corresponds with that of the English sergeant, and the rank of havildar-major with that of sergeant-major in an English regiment.

Havre, or LE HÂVRE, fort, seaport and harbour, dep. Seine-Inférieure, France, on the English Channel, 110 m. N.W. of Paris. It occupies low ground at the extreme N. of the Seine estuary, and residential suburbs extend on the high ground from Harfleur. The s. side along the estuary of the Seine is occupied by the

facture. The Havre exchange was the first in Europe to organize and regulate the terminal or option business in colonial produce, by which all transactions are registered in a clearing-house. The English held the town from 1562 to 1564. Pop. (1901) 130,196.

Hawaiian Islands, or HAWAII, formerly SANDWICH ISLANDS, an archipelago in the Pacific, stretching N.W. to S.E. from 22° to 18½° N., and from 160° to 154½° W., 2,700 m. S.W. of San Francisco. They include the islands of Hawaii (4,200 sq. m.), Maui (760), Oahu (600), Kauai (590), Molokai, Lanai, Niihau, and Kahulau. Total area, 6,450 sq. m. Of volcanic origin, the islands are mountainous, and more or less begirt with coral reefs. The highest points



of the bones, Havers being the first to detect the 'Haversian canals' in them. See BONE.

Haverstraw, vil., Rockland co., New York, U.S.A., on Haverstraw Bay, part of the Hudson R., 35 m. N. of New York; manufactures bricks. Pop. (1900) 5,935.

Haviland, JOHN (1790-1852), English architect, was born near Taunton, Somersetshire, and emigrated (1816) in his youth to the United States. Making a speciality of penitentiary buildings in the United States, he erected several of these, including the prisons at Pittsburg, Philadelphia, New York, in Rhode Island,

outer harbour and nine separate docks (five outer and four inner). The S.W. is the industrial suburb, and is crossed by the Canal de Tancarville (160 ft. by 14 ft.), which allows small craft and barges making for Rouen and Paris to reach the Seine without navigating the estuary. A new outer harbour, with 30 ft. water at low tide, is now nearing completion. The imports and exports together reached an annual value of nearly £100,000,000. The chief exports are wines, textiles, and 'articles de Paris.' The principal industries are shipbuilding, copper and nickel founding, distilling, and soap and candle manu-

facture. The Havre exchange was the first in Europe to organize and regulate the terminal or option business in colonial produce, by which all transactions are registered in a clearing-house. The English held the town from 1562 to 1564. Pop. (1901) 130,196.

are Mauna Kea (13,800 ft.) and Mauna Loa (13,700 ft.), both large, active craters in Hawaii. Other elevations are Haleakala in Maui (10,000 ft.), having an extinct crater 19 m. in circumference, and Kaala in Oahu (4,000 ft.). Kauai rises to 5,000 ft. The minerals include pyrites, common salt, sal-ammoniac, sulphur, nitre, coppers. The N.E. trade-wind (blowing most of the year) and the sea-breezes moderate the temperature, which at Honolulu averages 75°. The average yearly rainfall at Honolulu is less than 40 in.; on the opposite side of the island, 61 in. The chief disease is leprosy. The soil is very fertile.

A most useful tree is the algaroba. The chief products are sugar and rice; but wool, hides, bananas, and coffee are also exported. Peculiar to the islands are over seventy species of birds. Akin to the Maoris of New Zealand, the natives are of handsome physique and happy disposition. Imports for 1905 from United States were valued at £2,403,804; from foreign countries, £619,248. Exports to the United States amounted to £7,417,712 (sugar, £3,012,219); and to foreign countries, £12,229. The principal port is Honolulu. Discovered in 1549, the islands were in the 19th century recognized as an independent kingdom. In 1893 the reigning queen was deposed, and in 1894 a republic proclaimed. Annexed (1898) to the United States, the islands, on June 14,

Hawarden, small mkt. tn., Flintshire, N. Wales, England, overlooking the D.e. valley, 6 m. w. by s. of Chester; has coal mines, clay fields, brick works, and potteries. To the N.E. of the ruined thirteenth-century castle stands Hawarden Castle, the residence of Gladstone from 1874 till his death (1898). In 1895 Gladstone founded here St. Demiol's Library and Hostel for theological students. Pop. of par. (1901) 5,732.

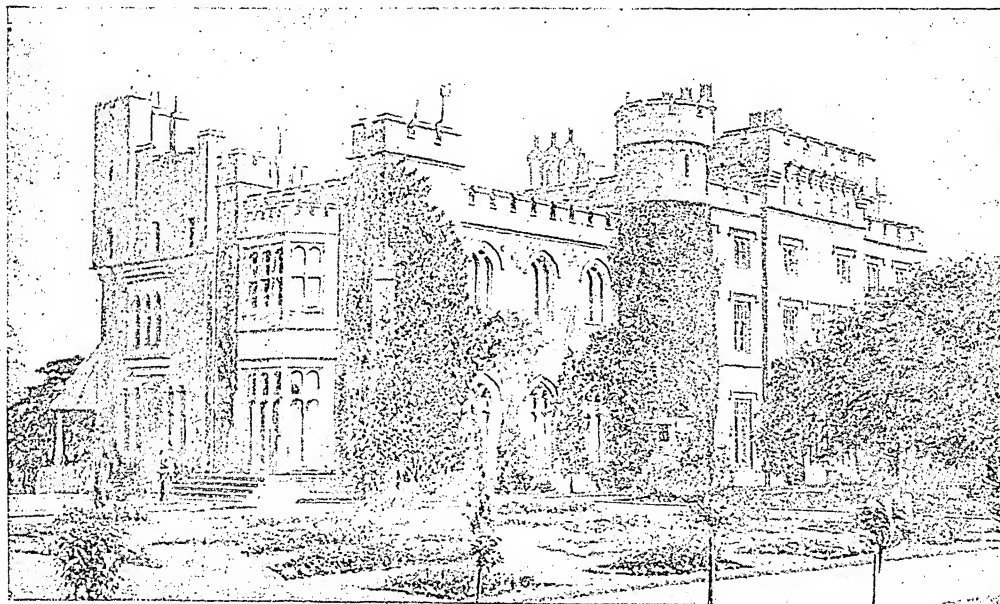
Haweis, HUGH REGINALD (1838-1901), English author, born at Egham, Surrey; became (1866) incumbent of St. James's, Marylebone (London), where his remarkable style of preaching and unconventionality attracted very large congregations. For a time he edited *Cassell's Magazine*. He was devoted to music, and was an

Hawfinch (*Coccothraustes vulgaris*), a member of the Fringillidae. It is abundant in South-



Hawfinch.

ern Europe, and has been recently extending its range, so that it now occurs throughout the greater part of England. It



Hawarden Castle.

[Photo by Jones.]

1900, were constituted the territory of Hawaii. The natives are mostly Christians, equally divided between the Protestant and Catholic faiths. Pop. (1900) 154,001, of whom 29,834 were native Hawaiians (as compared with 31,019 in 1896), 25,767 Chinese, and 61,111 Japanese. Cap. Honolulu. See *The Hawaiian Archipelago*, by Isabella Bird (1878); *Hawaiian Volcanoes*, by Captain Dutton (1885); *Fire Fountains: the Kingdom of Hawaii*, by C. F. Gordon Cumming (1883); *Hawaii and its People*, by Twombly (1900); *Hawaiian America*, by Whitney (1899); *The Real Hawaii*, by L. Young (1899).

expert on violins. His best-known books are *Music and Morals* (3rd ed. 1873); *Thoughts for the Times* (7th ed. 1874); *American Humourists* (1883); *Christ and Christianity* (1886-7); *Travel and Talk* (1896); *Sir Morell Mackenzie* (1893); and *Ideals for Girls* (1897).

Hawes, STEPHEN (d. ?1523), English poet, was probably a native of Suffolk; became groom of the privy chamber to Henry VII. His poetical works include *The Passe-Tyme of Pleasure* (1509), *The Conversion of Sycers* (1509), *The Exemple of Vertu* (1512), *The Comfort of Lovers*, and *The Temple of Glasce* (ed. Caxton, 1479).

is of a general brown colour, with black markings on the head, black wing quills, and a white tip to the tail. The nest is built in lichen-covered trees, and is made of twigs and lichens. The young are fed on caterpillars, but the adults live on peas and other seeds, cherry-stones being crushed with the strong bills for the sake of the kernel. As the name indicates, haws are greatly relished.

Hawick, parl. and munic. bur. and par., Roxburghshire, Scotland, on the Teviot, 53 m. S.S.E. of Edinburgh. The town is noted for hosiery and woollen manufactures, and has large weekly sales of live stock. In the vicinity are Branksome Castle, an old

stronghold of the Scotts of Buccleuch, the scene of Scott's *Lay of the Last Minstrel* and of one of Allan Ramsay's songs; the ancient family seats of the Scotts of Harden, Douglas of Cavers, the Eliots of Stobs, and other border clans. The Stobs estate, 3 m. s., was acquired in 1903 by government for a permanent military camp similar to that at Aldershot. There is an annual riding of the marches, or 'common riding.' Along with Galashiels and Selkirk it returns one member to the House of Commons. Pop. (1901) of tn. 17,303; par. 18,502.

Hawk, a term sometimes applied to all the members of the sub-family Accipitrinae, and then includes the harriers, etc.; at other times restricted to the members of the genus *Accipiter*. See SPARROW-HAWK, GOSHAWK, etc.

Hawkbit, the popular name of plants belonging to the genus *Apargia*, a subdivision of the Composite. The distinguishing marks of the genus are the strap-shape of the florets, the unequally imbricated involucre, the tapering form of the fruit, and the one-row feathery pappus. The two common British species are the autumnal hawkbit (*A. autumnalis*), and the rough hawkbit (*A. hispida*), both with yellow flowers, but the former having many-flowered stalks, the latter with single-flowered stalks. Both are autumn bloomers. The leaves are all root-leaves.

Hawke, a British first-class protected cruiser (7,350 tons), launched at Chatham in 1891. The first large ship of the name seems to have been launched in 1820.

Hawke, EDWARD, LORD (1705-81), English admiral, born in London; first distinguished himself in the action off Toulon in 1744, and in 1747 gained a victory over the French off Finisterre. In 1757, when he became an admiral, he commanded an expedition to Basque Roads, but, owing to the incapacity of his military colleague, was unable to accomplish anything; but he returned to the same waters in the following year, and drove a number of ships ashore. The battle which brought him his chief fame was gained in 1759 over Marshal Conflans in Quiberon Bay, one of the most daring and successful actions on record. In 1766 he was appointed First Lord of the Admiralty and vice-admiral of England. He remained at the Admiralty until 1771, and while there was made, in 1768, admiral of the fleet.

Hawk-Eagle, a name applied by ornithologists to two groups of eagles—(1) to the crested eagles of the genus *Spizaetus*, and (2) to the members of the genus *Nisa-*

etus. An example of the former is the warlike crested eagle (*S. bellicosus*), which reaches a length of thirty-one inches, and is found in S. Africa. An Indian species of the same genus (*S. caligatus*) is called the 'peacock-killer,' and is very destructive to game-birds of all kinds. The same name is given in India to a member of the genus *Nisaetus*. In this genus the crest is absent, and the birds in certain minor points approach more nearly to the true eagles of the genus *Aquila*.

Hawker, ROBERT STEPHEN (1803-75), English poet, was born at Stoke Damarel, Plymouth. Bishop Phillpotts in 1834 presented him to the vicarage of Morwenstow, Cornwall, where he laboured forty years, practically restoring places and people to civilization. He died at Plymouth, becoming a Roman Catholic twelve hours before death. Hawker's Cornish poems have genuine quality. His *Records of the Western Shore* (1832-6), included in *Eccelesia* (1840), reappeared, with additions, as *Reeds Shaken with the Wind* (1843), and a second set was published in 1844. With *Genevieve* they were reissued in *Echoes from Old Cornwall* (1846). The fragmentary *Quest of the Sangraal* (1864) vigorously illustrated Hawker's theory of spiritual warfare. In 1869 he published his earlier poems as *Cornish Ballads*. He happily detailed local traditions in *Footprints of Former Men in far Cornwall* (1870). An interesting but somewhat diffuse biography of Hawker is Mr. Baring-Gould's *The Vicar of Morwenstow* (1876). Mr. J. C. Godwin edited the *Poems* with a short memoir in 1879. See also the Rev. F. G. Lee's *Memorials of the late Rev. R. S. Hawker* (1876), and *Life and Letters of Hawker of Morwenstow*, by C. E. Byles (1905).

Hawkers and Peddlers. A hawker is a person who travels with any beast of burden or by any means of locomotion to a place where he does not usually reside or carry on business, carrying goods for sale in any house, shop, stall, or other place, hired or used for that purpose (Hawkers Act, 1888). A peddler is a hawker, petty chapman, tinker, mender of chairs, travelling on foot from town to town selling goods, or his skill in handicraft (Pedlars Acts, 1871 and 1881). A peddler obtains an annual 5s. certificate from the police, a hawker an annual £2 licence. Both certificate and licence are good throughout the United Kingdom, are only given on evidence of good character, must be produced on demand, and are not transferable. Commercial travellers, sellers of fish, fruit, or victuals, and sellers in public mar-

kets need not take out peddler's or hawker's certificate, while the real worker or maker of goods, or his servants selling goods made by him, does not need a hawker's licence. A hawker may not hawk petroleum unless he is a licensed petroleum seller (Petroleum Hawkers Act, 1881), nor gunpowder in a street or public place (Explosives Act, 1875), nor postage stamps, unless he is a servant of the post-office (Stamp Act, 1891), nor gold or silver plate without an additional licence (Revenue Act, 1867), nor tobacco (Tobacco Act, 1842), nor spirits (Spirits Act, 1880). In order to obtain his annual licence a hawker must produce a certificate of good character, signed by the clergyman and two householders of his parish, or an inspector of police, or a justice. Hawking without a licence is punishable with a fine of £10, and forging a licence with a fine of £50.

Hawke's Bay, provincial dist., on E. coast of North Island, New Zealand, midway between Auckland and Wellington. Area, 2,822,300 acres. It has rich alluvial plains and undulating hills, with fine forests in the S. The N. is devoted to sheep runs, and is the great breeding-ground of the colony. Natives own much of the land. At Te Aute is a Maori training college. Napier is the capital and port. Pop. (1901) 35,424.

Hawkesbury, riv. of N.S.W., Australia, rising on the E. watershed and falling into the Pacific Ocean. Its length is 330 m., and its drainage area over 8,700 sq. m.

Hawkesworth, JOHN (1715-73), English author, born in London; was as a young man employed on the *Gentleman's Magazine*. In 1752 he with others started the *Advertiser*. He subsequently edited Swift's *Works* (1755), and an account of *Voyages for making Discoveries in the Southern Hemisphere* (1773). He also wrote one or two plays (*Edgar and Emmeline*, at Drury Lane in 1761), and adapted others for the stage.

Hawking. See FALCONRY.

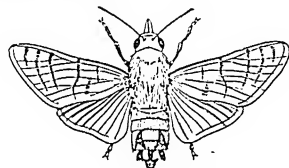
Hawkins, ANTHONY HOPE. See HOPE, ANTHONY.

Hawkins, CÆSAR HENRY (1798-1884), English surgeon, was born at Bisley, Gloucestershire, was appointed surgeon to St. George's Hospital (1829), and held the post till 1861. He was twice president of the Royal College of Surgeons (1852 and 1861), and became sergeant-surgeon to Queen Victoria (1862). For many years he was credited with being the only surgeon who had performed ovariectomy successfully in a London hospital. His memoirs and lectures were reprinted in 2 vols. in 1874.

Hawkins, SIR HENRY (1817), **BARON BRAMPTON**, judge of the Queen's Bench Division, born at Hitchin, Hertfordshire; called to the bar in 1843, and in 1858 became a Q.C. He obtained a lucrative practice, and, among other cases, was engaged for the defence in *Saurin v. Star* in 1869, also as prosecuting counsel in the trial of the claimant in the Tichborne case (1874), and in the St. Leonards will case. He was appointed a judge in 1876, being raised to the peerage as Baron Brampton in 1899. He published his *Reminiscences* (1904; 2nd ed. 1905).

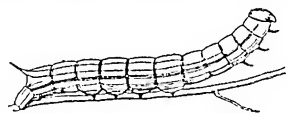
Hawkins, SIR JOHN. See **HAWKINS.**

Hawkins, SIR JOHN (1719-89), English lawyer, born in London. After retiring from practice, he became one of the founders of the Madrigal Society, and published a carefully compiled *General History of Music* (1776), which is even now of value. Hawkins also published a *Life of Dr. Johnson* (1787), together with an edition of his *Works*.



Hawk-moth.

Hawk-moth, a general name for the members of the family Sphingidae, which are all large, powerful moths, with small hind-wings, hooked antennae, and smooth larvae, which pupate in earth. To this family belong the death's-head moth, the very handsome cleander hawk-moth, (*Sphinx nerii*), the spurge hawk-moth (*Deilephila euphorbiae*), and the humming-bird hawk-moth (*Macroglossa stellatarum*), which is often mistaken for a humming-bird. Rare in Britain, but com-



Hawk-moth (Caterpillar).

mon and destructive on the Continent, is the pine hawk-moth (*Sphinx pinastri*), whose larva feeds on the pine-tree. Like the caterpillars of other species, this larva is protectively coloured, having narrow longitudinal bands of red and white on a green ground. As in most species, there is a curious 'horn' at the end of the abdomen.

Hawksbeard, the popular name of plants belonging to the genus *Crepis*, a subdivision of the Com-

positae. Their distinguishing features are the strap-shaped florets, double involucre, and down-like pappus. The commonest British species is the annual smooth hawksbeard, which bears its yellow flowers in autumn. It has smooth, pinnatifid leaves.

Hawksbee, or HAWKS BEE, **FRANCIS** (d. 1713), English physicist, was an ingenious experimenter in electrical, chemical, and mechanical science. Elected a fellow of the Royal Society (1705), he holds a recognized place among early workers in electrical science. He was the author of *Physico-Mechanical Experiments* (1709), contributed memoirs to the *Philosophical Transactions*, and made an electrical machine (1706), using a pretty large glass cylinder, turned by a winch, and rubbed by the hand.

Hawkshaw, SIR JOHN (1811-91), English engineer, born in the W. Riding of Yorkshire. Chief engineer to the Manchester and Leeds Ry., and, later, to the Lancashire and Yorkshire, he constructed the Charing Cross and Cannon Street railway and bridges, a section of the Underground Railway, London, and the Severn Tunnel (1887). He constructed various docks and Holyhead harbour.

Hawksley, THOMAS (1807-93), English engineer, was born at Arnold, near Nottingham. After removing to London (1852), he became engaged in questions of water and gas supply and main drainage, and supplied water to Liverpool, Sheffield, Leeds, Oxford, Cambridge, Darlington, and Stockholm, and a constant supply system for Nottingham, as well as drainage systems for Birmingham, Worcester, etc.

Hawkweed, or HIERACIUM, is a genus of composite plants, characterized by the imbricated involucre, furrowed and toothed fruit, and bristly pappus. Numerous species occur in Britain, among the commonest being *H. murorum*, the wall hawkweed, with small yellow flower-heads and almost leafless flower-stem; and *H. pilosella*, the mouse-ear hawkweed, with creeping offshoots, villous leaves, and pale-yellow flowers.

Hawkwood, SIR JOHN DE (d. 1394), English soldier, known in Italy as **GIOVANNI L'ACUTO**, was born at Heddingham Sible, Essex; fought under the Black Prince, and from 1363 onward in the Italian wars, for Pisa against Florence, for the Visconti against Pope Gregory XI., and for the Pope against the Visconti, until finally he was secured as captain of mercenaries by Florence. See *Life* by Temple Leader and Marcotti (trans. by Mrs. Leader Scott, 1889).

Hawkyns, or HAWKINS, SIR JOHN (1532-95), English seaman, was born at Plymouth, and in 1552 engaged in the slave traffic, being the first Englishman to do so. Aided by the profits of smuggling, and of raids upon Spanish shipping, he was able to conduct two more voyages to the W. Indies, one in 1564, and another, with Drake, in 1567. In the latter he was attacked by the Spanish authorities at San Juan de Ulloa, and succeeded in saving only two of his ships. In 1572 he entered Parliament for Plymouth. In 1588 he was given a command as rear-admiral against the invincible Armada. Two years later, in company with Sir Martin Frobisher, he intercepted the Plate fleet off the coast of Portugal. In 1595 he departed with Sir Francis Drake to command an expedition to the W. Indies, and died on the voyage.

Hawkyns, SIR RICHARD (1562-1622), English naval commander, son of Admiral Sir John Hawkyns. Having served under Drake (1585-6), and against the Armada (1588), he sailed from Plymouth on the *Dainty* (June 1593), passed through Magellan Strait, surprised and plundered Valparaiso (April 1594), but was defeated and severely wounded at San Mateo, and carried prisoner to Spain. Released in 1602, he was knighted (1603), and returned M.P. for Plymouth (1604). See his *Observations in his Voiage into the South Seas* (edited for the Hakluyt Soc. with biography by Sir C. R. Markham, 1878).

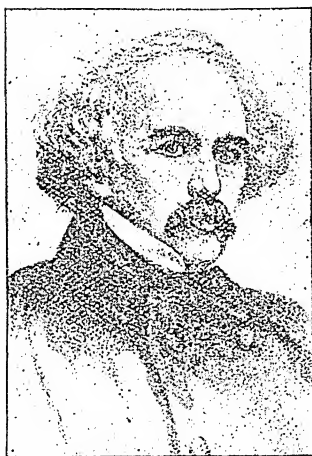
Haworth, vil., 4 m. s. of Keighley, Yorkshire, England. The wild scenery of the neighbourhood, and the stern, rugged character of the inhabitants, are reflected in the novels of the Brontë sisters, who lived and died in the village. There are large worsted factories. Pop. (1901) 7,492.

Hawser, a large rope or small cable of three or four strands, being smaller than a cable and much larger than a tow-line. Hawser-laid ropes are made of three strands; cable-laid ropes of nine strands, the three greatest strands each containing three small ones. Many modern hawsers are made of steel wire.

Hawthornden, or MAY (*Crataegus oxyacantha*), a British tree and hedgerow bush, belonging to the order Rosaceae, extensively employed as a hedging plant. It has a spiny habit, glabrous leaves, deeply cut into three or more segments, and white roseaceous flowers arranged in corymbs. The flowers have a characteristic fragrance, and are followed by haws or fruit, which turn dark red in autumn.

Hawthornden. See **ROSLIN.**

Hawthorne, NATHANIEL (1804-64), American author, born at Salem, Massachusetts. During the early part of 1836 he visited Boston, becoming editor of the *American Magazine*. His connection with the community of transcendentalists at Brook Farm only lasted for a year (1841). From 1839 to 1841 he held an appointment in the custom-house in Boston, and was customs surveyor of Salem (1845-9). In 1842 he went to live in the manse in Concord, which he rendered famous in *Mosses from an Old Manse* (1846). He was American consul at Liverpool, 1853-7. In 1860 he returned to Concord, where he died. His chief works



Nathaniel Hawthorne.
(From 'Hawthorne and his Circle'.)

are *The Scarlet Letter* (1850), *The House of the Seven Gables* (1851), *Twice-Told Tales* (1837, enlarged 1842), *The Snow Image* (1852), *The Blithedale Romance* (1852), *The Marble Faun* (1860), *Our Old Home* (1863), *Septimius Felton* (1871), and *The Dolliver Romance, and Other Pieces* (1864-76). The best editions of his complete works are the 'Wayside' and the 'Riverside' (1883), with Lathrop's notes.—His son, **JULIAN HAWTHORNE** (1846), born in Boston, Massachusetts, is also a novelist. In 1869 he joined the dock department of New York as hydrographic engineer. His novels and other works include *Bresant* (1873), *Idolatry* (1874), *Saxon Studies* (1876), *Nathaniel Hawthorne and his Wife* (1885). See *Lives* by Henry James, jun. (1879), George E. Woodberry (1902), and J. T. Fields (1876); Lathrop's *Study of Hawthorne* (1876); Lathrop's *Memories of Nathaniel Hawthorne* (1883); *Hawthorne and his Circle*, by Julian Hawthorne (1903); Dhaléine's *N. Hawthorne, sa Vie et son Œuvre* (1905).

Hawtrey, CHARLES HENRY (1858), actor and dramatist, born at Eton; made a good beginning in *The Colonel* (1881). His adaptation of *The Private Secretary* (1884), from a German source, ran for nearly nine hundred consecutive performances. *Jane*, another play from his pen, was also well received. Mr. Hawtrey is not only one of the best-known actors on the London stage, but is also a clever manager. See the account of the Hawtrey family (1903) by F. M. Hawtrey.

Hay and Ensilage. Hay is the air-dried produce of meadows. The younger the grass is mown, the better will be the quality of the hay; but if it is allowed to stand until the seed forms, the soluble cellulose, sugar, and extractive matter become converted into indigestible woody fiber. The quality of hay is affected by the nature of the soil, and by the species of grasses composing it; but the former is, in this respect, the more important factor. The grasses most suitable for making hay have been described in the article GRASSES. The best hay contains a proportion of clovers, lotus, medick, and miscellaneous herbage of several kinds interspersed among the leafy parts and the young stems of the grasses proper. It should be secured in dry but not scorching weather, and should heat slightly in the rick. If over-made, the rick will not settle down to the degree which produces a firm truss, and will lack the aromatic flavour and properties of first-rate hay. Hay improves with age. The composition varies according to its source and the conditions under which it was made, as will be seen by the following analyses:—

Description of Hay.	Water.	Ash.	Albuminoids.	Crude Fibre.	Extractive Matter free from Nitrogen.	Fat.
Meadow hay, poor	14.3	5.0	7.5	33.5	38.2	1.5
" " average.....	14.3	6.2	9.7	26.3	41.6	2.3
" " good.....	15.0	7.0	11.7	21.9	42.3	2.2
" " very prime..	16.0	7.7	13.5	19.3	40.8	2.6
Red clover hay, poor	15.0	5.1	11.1	28.9	37.7	2.1
" " average....	16.0	5.3	12.3	26.0	38.2	2.2
" " good.....	16.5	6.0	13.5	24.0	37.1	2.9
" " very prime	16.5	7.0	15.3	22.2	35.8	3.2

ENSILAGE.—This process is largely used in Hungary, Austria, and France. It is carried out by throwing fresh grass, green maize, lucern, or other green fodder, together in trenches (silos). Maize, cut when in a succulent condition, and put through a

powerful chaff-cutter, is trampled by foot into a compact mass, which is held in place at the ends and sides by wooden partitions. This constitutes an efficient silo, and, when full, may be covered by galvanized sheeting to protect it from the weather. Soon after ensilage was introduced into England in 1873, it was made formidable by the introduction of expensive appliances, such as permanent brick-built silos fitted with elaborate presses, or of wire ropes for squeezing or pressing down the material, in order to exclude the air. But these refinements are not necessary, as excellent silage may be prepared by using the natural weight of the material itself. If the green grass is spread over a sufficient space of ground, and the green fodder is added much in the same manner as a dung-heap is built, it will keep. The only precautions necessary are to preserve the sides of the heap perpendicular, and to roll down the grass as added, especially around the outsides of the heap. The middle portions require no special care. Silage heaps of this class should not be made all at one time, but over an extended period of ten or twenty days, by successive cartings at intervals of three or four days. This allows the heap to settle, and the fresh additions weight the under portion, and prevent over-heating. When completed, the silo may be protected by galvanized iron or boards. Ensilage is largely used in America, New Zealand, and the British colonies. The value of silage as a food is probably about the same as the material from which it was derived.

Hay. (1.) Town, Murrumbidgee

R., centre of Riverine dist., New South Wales, Australia, 454 m. s.w. of Sydney. Pop. (1901) 3,014. (2.) River, rises in dist. of Mackenzie, British North America, and flows N.E. for about 350 m. into the s. of Great Slave Lake. In its course there are

two falls, the Alexandra being 250 ft. high. It is navigable for about 140 m. up.

HAY, JOHN (1838-1905), American secretary of state, was born at Salem, in Indiana; was called to the bar, and practised in the supreme court of Illinois. He was for some time (1870-5) attached to the staff of the *New York Tribune*. During the whole of Lincoln's presidency, Hay was one of his private secretaries and his trusted friend. After the death of Lincoln, Hay held diplomatic appointments (1865-70) at Paris, Vienna, and Madrid. Under President Hayes, he was first assistant-secretary of state of the United States from 1879 to 1881. In February 1897, on the accession of McKinley as president, he was appointed American ambassador to Great Britain in succession to Mr. Bayard. He remained in London little more than twelve months, for in 1898 he returned to Washington as secretary of state. This position he also held under McKinley's successor, President Roosevelt (1905). Colonel Hay's contributions to literature include *Pike County Ballads* (1871), in which at least two types of men have made their appearance in literature—Jim Bludso, the steamboat man of the west, and Banty Tim, the negro soldier of the civil war; *Castilian Days* (1891); and, in collaboration with Colonel J. G. Nicolay, *Abraham Lincoln: A History*, in 10 vols. (1890).

HAY, SIR JOHN CHARLES DALRYMPLE (1821), British admiral, was born at Edinburgh; distinguished himself off the Syrian coast (1839-42), and in Borneo (1845); destroyed the Chinese pirate fleets in Bias Bay, China, and Tong-king R. (1849); and commanded H.M.S. *Hannibal* at the capture of Kertch and Kinburn, and the fall of Sebastopol. Succeeding to the title as third baronet, he became M.P. for Wakefield (1862-5), Stamford (1866-80), and Wigtown burghs (1880-5), and was promoted admiral (1878). In 1866-8 he was a lord of the Admiralty. Among his published works are *The Flag List and its Prospects* (1870), *Ashanti and the Gold Coast* (1873), *Our Naval Deficiencies* (1883), *Piracy in the China Sea* (1889), and *Lines from my Log-books* (1898).

HAYASHI, TADASU, VISCOUNT (1850), Japanese statesman and diplomatist, was born at Sakura, Shimosa, Japan, and was educated (1866-8) in England. As a student he figured in the revolutionary movement which has had much to do with the modern rise of Japan. Hayashi was secretary to the Japanese embassy to the courts of Europe (1872-3), vice-

minister of foreign affairs (1891-95), envoy extraordinary to China (1895-6), envoy to Russia (1897-9), and in 1900 he was appointed Japanese minister to Britain, but in 1906 was called home and made minister of foreign affairs. He was created a baron in 1896, and a viscount in 1902 for his services in connection with the Anglo-Japanese treaty. Viscount Hayashi also signed the new treaty of 1905 on behalf of Japan. He is the author, in English, of *For His People* (1903).

HAYDEN, FERDINAND VANDEVEER (1829-87), American geologist, born at Westfield, Massachusetts; established his reputation by exploration work in Dakota, Missouri, and the north-western territories. After serving as a surgeon in the Federal army during the civil war, he was appointed professor of geology and mineralogy in the University of Pennsylvania. In 1867 he was transferred to the geological survey of the United States, and employed in the north-west, his reports on the Yellowstone region (1872) being largely instrumental in persuading Congress to declare it a national park.

HAYDN, JOSEPH (1732-1809), Austrian musical composer, born at Rohrau, near Vienna. At eight he joined the choir of St. Stephen's Cathedral, Vienna, and there remained till supplanted at seventeen by his brother Johann. In the meantime he made useful friends—Metastasio, the Italian poet and librettist, and Porpora, the Italian singing master; also he composed his first stringed quartet. In 1760 he became leader of Count Morzin's band, and issued the first of his 125 symphonies; and next year saw the beginning of the lifelong connection with his patrons the Esterhazys, and his appointment by them as musical director at Eisenstadt and Esterhaz. As musical director, Haydn wrote marionette, German, and Italian operas (now little known), works for wind instruments, the clavier, the barytone (a sort of viol de gamba), stringed quartets, and notably symphonies, among them *Farewell* and *Joy*. He wrote six of his great symphonies for England, and directed them himself under a contract with Salomon the *entrepreneur*. Six more great symphonies signalized the second visit. The 'Emperor's Hymn' (1797), *Gott erhalte Franz den Kaiser*, was possibly suggested by *God save the King*. Two choral works crown the end of a great career, *The Creation* (1799) and *The Seasons* (1801), with libretti remotely due to *Paradise Lost* and Thomson's *Seasons*. The former immediately acquired great popularity. Haydn is a master of

melody, and 'the creator of the symphony.' See *Biography* by K. F. Pohl (1875-81), completed by E. von Mandyczewski (1890); and *Haydn in London*, by Karajan (1861).

HAYDOCK, par. and tm., Lancashire, England, 3½ m. N.E. of St. Helens, has iron works and coal mines. Pop. (1901) 8,575.

HAYDON, BENJAMIN ROBERT (1780-1846), English painter, born at Plymouth. Admitted a student of the Royal Academy (1805), he exhibited his first picture in 1807. Excessively vain, and flattered by fashionable people, he believed that his *Dentatus* (1809) would mark an epoch in English art. But the Academy gave it an indifferent position, fashion deserted him, and he began a life-long struggle with debt. *The Judgment of Solomon* (1814) brought both money and admirers; but *Christ's Entry into Jerusalem* (1820), the fruit of six years' labours, although it made a large sum on exhibition, proved unsaleable; and upon the completion (1823) of *The Raising of Lazarus*, Haydon was arrested for debt. He suffered another heavy blow when his historical cartoons for the decoration of the new Houses of Parliament, his life's ambition, were rejected. Desperate with debt, and unable to paint, he died by his own hand. See Paston's *B. R. Haydon and his Friends* (1905).

HAYES, MRS. CATHARINE, née HALL (1690-1726), English murderess, born near Birmingham; married a carpenter, whom afterwards in London she murdered with the aid of her two paramours and lodgers, Wood and Billings. She was convicted and sentenced to be burnt alive at Tyburn, and Wood and Billings to be hanged. Thackeray's *Catharine* is based on her career.

HAYES, CATHERINE (1825-61), Irish singer, born in Limerick; studied under Garcia in Paris, and made her first appearance at Marseilles in *I Puritani* (1845), afterwards singing in Milan, Vienna, London (as Linda di Chamouni), the United States, and India. She had a soprano voice ascending to D in alt.

HAYES, ISAAC ISRAEL (1832-81), American Arctic explorer, born in Chester co., Pennsylvania; served in the second Grinnell expedition (1853-5) under Dr. Kane. In 1860 he sailed again, and wintered in Smith Sound, from that base making a sledge journey. Author of *An Arctic Boat Journey* (1860), *The Open Polar Sea* (1867), and *The Land of Desolation* (1872).

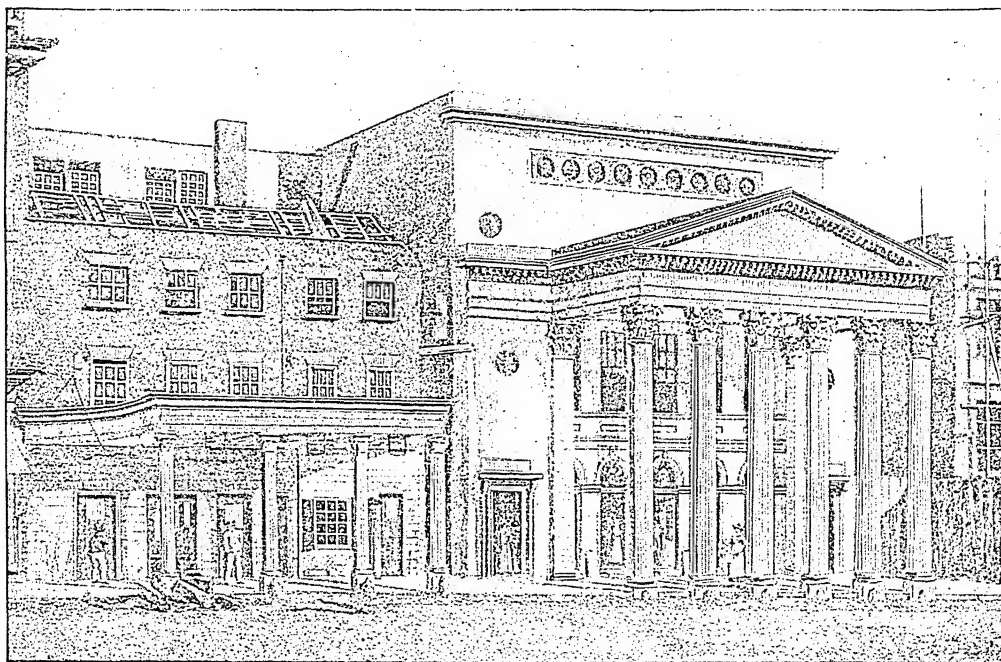
HAYES, RUTHERFORD BIRCHARD (1822-93), American president and statesman, born at Delaware, Ohio; practised successfully as a

barrister, and distinguished himself in the civil war, in which he was four times wounded. He sat in Congress (1855), and was governor of Ohio (1867-72 and 1875). Having attracted attention by the part he took in the 'sound money campaign,' he unwillingly stood for the presidency, as a republican candidate, against the democrat Tilden; and when the election was disputed, he was declared the successful competitor by a special commission appointed to inquire into the matter (1877). As president he alienated the republicans by reform measures; but he pacified the South, introduced competitive examinations for appointments in the civil service, and

nose, such as nasal polypi, deviations of the septum, and disease of the turbinated bones, or of the mucous membrane over them. In the majority of cases, too, the patient is of neurotic constitution, and certain families manifest a liability to the disease. The symptoms are those of severe coryza, but the headache may be more intense, and paroxysms of asthma may occur which are indistinguishable from the ordinary bronchial form. The coryza is often accompanied by great swelling of the nose and eyelids. In attempting to cure hay fever, the physician must, if possible, find and remove the cause. For temporary relief try spraying or

plays were produced by Colman. His *Life of Cowper* (1803) is the standard biography of the poet. See his *Autobiography* (1823).

Haymarket Theatre, London. The first theatre of this name was built by Vanbrugh in 1705. Another (Little Haymarket Theatre) was built by John Potter in 1720. In 1730 Henry Fielding began to write for its stage, and six years later he became manager. In 1744 Macklin, having quarrelled with the management of Drury Lane, appeared at the Haymarket with a company which included Samuel Foote; but the house, not being licensed, was more than once closed by the patentees of Drury Lane and



Haymarket Theatre, Old and New.

brought about the resumption of specie payments after the war. See *Lives* by W. D. Howells (1876) and Howard (1876).

Hay Fever is a catarrhal condition of the mucous membrane lining the upper respiratory passages. It depends upon the action of various irritants on a hyperæsthetic or oversensitive membrane. Of the irritants the chief are the air-borne pollen grains of certain grasses, so that the condition is often called catarrhus æstivus, or summer catarrh. In some patients furs and feathers and the smell of particular flowers play a leading part. In a great number of cases, however, there exists a local abnormality in or about the

painting the nasal mucous membrane with cocaine or quinine. Adrenalin snuff is also of great service in controlling the catarrhal condition. The asthma may be treated as an ordinary bronchial attack by inhalation or by internal administration of antispasmodics. In addition, nerve tonics, such as arsenic, phosphorus, and strychnine, are employed to combat the neurotic element.

Hayley, WILLIAM (1745-1820). English author, was born at Chichester, Sussex. By his *Triumphs of Temper* (1781) he became the most popular poet of his day. He also wrote an *Essay on Old Maids* (1785), and a *Life of Milton* (1794), while two of his

Covent Garden, who invoked the powers of the lord chamberlain. In 1747 Foote evaded the law by turning the Haymarket into a nominal tea-house. The audience paid for refreshment, and the theatrical performance was given gratis. In 1777 Colman became manager. Colman's son-in-law, Morris, pulled down in 1820 Potter's old house, and spent £20,000 on a new one, which was opened in July 1821 with *The Rivals*. His company included Wm. Farren, Mme. Vestris, Mrs. Waylett. A little later Benjamin Webster joined the Haymarket troupe, and in 1837 assumed control until 1853. In 1873 Mr. W. S. Gilbert made his bow to Haymarket pa-

trons with *Pygmalion and Galatea*. And in 1880-5 the Bancrofts, after entirely rebuilding the theatre, revived most of the Robertsonian comedies. In 1887-95 Mr. Beerholm Tree was manager of the Haymarket. His most noteworthy achievements were the production of *Hamlet* in January 1892, and his introduction of Maeterlinck to the British public with *The Intruder*. Mr. Frederick Harrison succeeded Mr. Tree. During his first season (1895-6), *Under the Red Robe*, by Ed. Rose, and the first part of *Henry IV.* were produced. Among more recent productions have been Mr. J. M. Barrie's *The Little Minister* (1897), Mr. H. A. Jones's *The Manzures of Jane* (1898), Mr. S. Grundy's *The Degenerates* (1899), Mr. H. H. Davies's *Cousin Kate* (1903), Mr. H. A. Jones's *Joseph Entangled* (1904), J. B. Fagan's *Shakespeare v. Shaw* (1903), and *The Creole* by L. N. Parker (1905).

Haynau. See HAINAU.

Haynau, JULIUS JAKOB, FREIHERR VON (1783-1853), Austrian general, born at Kassel, natural son of William I., Elector of Hesse; entered the Austrian service (1801), and attained the rank of field-marshal (1844). During the Italian campaign of 1848-9 he acquired an unenviable reputation for cruelty, especially in the repression of the insurrection at Brescia. Summoned to Hungary to take command of the imperial forces, he turned the tide of revolution (1849) by the storming of Raab (June 1849), the victory of Szegedin (Aug. 3, 1849), and the Theiss campaign (Aug. 9, 1849). He incurred public dislike, and was molested in the streets of both Brussels and London. Baron Schönhals in his *Leben Haynau's* (3rd ed. 1875), and subsequent writers, defend the marshal.

Hayne, ROBERT YOUNG (1791-1839), American statesman, born in Colleton, S. Carolina; fought against the British (1812), and was state attorney-general (1818-22), and United States senator (1823-32). A determined advocate of state rights and a vigorous opponent of protection, he led the movement directed towards the nullification of the 1832 Tariff Bill. Daniel Webster and President Jackson denounced him; but in November 1832 S. Carolina passed a nullification ordinance, Hayne was elected governor, and the state prepared for civil war. Congress, however, modified the obnoxious Tariff Bill, and the nullification was rescinded. See *Life* by Paul H. Hayne (1870).

Hayter, HARRISON (1825), English engineer, was born at Flushing, near Falmouth, and became a civil engineer in Westminster. With Sir John Hawkshaw he was engaged in the construction

of many public works, including the Charing Cross and Cannon Street bridges and stations, the Holyhead harbour of refuge, the Amsterdam ship canal, the Severn tunnel, and the Buenos Ayres docks.

Hayti. See HAITI.

Hayward, ABRAHAM (1802-84), English essayist, born at Wilton, near Salisbury. He founded and was joint-editor of the *Law Magazine* (1828). His translation of Goethe's *Faust* (1833; enlarged 1834) was considered by Carlyle the best English version. Hayward wrote for the *Law Magazine* (ix. 392-413), *Quarterly Review* (1836), *Fraser's*, and other journals. Of his controversial articles, those on the authorship of Junius in *Fraser's*, in which he denied the claims of Francis, also an account of the life of John Stuart Mill in the *Times* of May 10, 1873, attracted wide attention. Among his best works are *Diaries of a Lady of Quality* (1864); *Goethe* (1877; new ed. 1898); *Sketches of Eminent Statesmen and Writers* (1880); *Biographical and Critical Essays* (1858-74); *Art of Dining* (new ed. 1899); and *Short Rules for Modern Whist* (1878). He was one of the greatest whist players. See *Selections from his Correspondence*, ed. by H. E. Carlisle (1886).

Haywood, MRS. ELIZA (?1693-1756), English authoress, born in London; appeared in public as an actress in Dublin about 1715, and afterwards in London. Under the name of 'Sappho' she figures in the *Tatler* as the friend of Steele, to whom she dedicated a collection of her novels (1725). She rewrote *The Fair Captive* for Rich (1721), and wrote *A Wife to be Lett* (1723), acted at Drury Lane. She is chiefly known by her novels, *Love in Excess* (1724), *The Injured Husband* (1724), *The British Recluse* (1722), etc.; and her *Memoirs of a certain Island adjacent to Utopia* (1725), and *The Secret History... of the Court of Caramanica* (1727), excited the wrath of Pope in *The Dunciad*.

Hazara, dist. in the Peshawar div. of Panjab, India, with an area of 2,991 sq. m., consists of a long, narrow valley which pierces the outer range of the Himalayas. The chief town is Abbottabad. Pop. (1901) 560,288.

Hazaras, a tribe who occupy the Taimani highlands between Kabul and Herat in Afghanistan, some of their villages being situated from 5,000 to 10,000 ft. above sea-level. They are of Mongol origin, and there are two main sections—the Aimaks, rigid Sunnis, in the west, and the Hazaras proper, Shiahs, in the east. They indulge in violent intertribal disputes, and show much cruelty to the vanquished. They are

successful breeders of cattle and horses, and make strong and useful labourers.

Hazard, a game with dice, formerly popular in England, was played in several ways. In its simplest form two dice were used, and there were two players—one called the 'caster,' and the other the 'setter.' The caster 'called a main'—that is, called one of the following numbers: 5, 6, 7, 8, or 9. He then threw. If he threw the main, or 11 (when 7 was the main), or 12 (when 6 or 8 was the main), he won. If he threw 2, or 3, or (except in the cases just mentioned) 11 or 12, he lost. If he threw any other number, it was called his 'chance,' and he continued to throw till either the main or the chance turned up. If the chance was thrown first, he won; if the main, he lost.

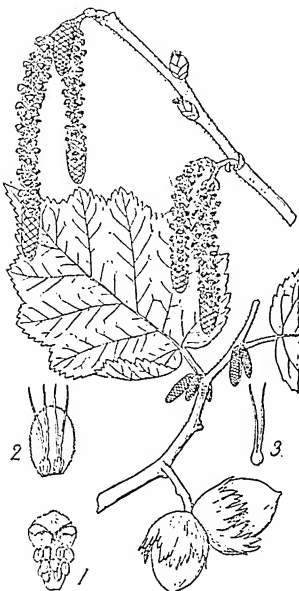
Hazaribagh, chief tn. of dist. of same name, Chota Nagpur, Bengal, India; was the military headquarters of the district until 1874. Pop. (1901) 15,799. The district (area, 7,021 sq. m.) contains coal fields and tea plantations. Pop. (1901) 1,177,961.

Haze is generally produced by dust. It usually occurs during an anticyclone, when fine, dry weather prevails. Haze is sometimes the product of forest fires, and in some parts of N. Europe the smoke during the burning of the peat bogs or heather dulls the sky for weeks at a time. Very fine mineral dust from deserts or volcanoes also causes haze. On rare occasions a stratum of haze forms at a great elevation above the earth, while the lower atmospheric strata remain unusually clear. Under these conditions the blue rays of the solar spectrum are absorbed, causing the sun's light to assume a sort of pink or carmine colour, with strange effects on the surrounding landscape. (See Symon's *Meteorological May.*, vol. v. p. 65.) The 'Indian summer' of the United States is due to haze. Consult Russell's 'Haze, Fog, and Visibility,' in *Quart. Jour. Roy. Met. Soc.* (vol. xxiii. p. 10); 'Haze and Transparency near Haslemere' (*ibid.* p. 145); 'Results of Observations on Haze and Transparency in 1897,' *op. cit.* (vol. xxiv. p. 207).

Hazebroutch, tn., dep. Nord, France, 24 m. S. of Dunkirk; has manufactures of flour, textiles, and soap. Pop. (1901) 13,261.

Hazel (*Corulus avellana*), a common British tree and hedge-row shrub, belonging to the order Amentaceæ. It has a gray and bright brown bark, rough, nearly circular leaves, yellow male catkins, and tiny crimson female flowers, which are followed by the fruit in the form of the well-

known hazelnuts. The wood of the hazel is used for the construction of rustic arbours and seats.



Hazel (*Corylus avellana*).

1, Scale, male catkin, with anthers; 2, upper scale female; 3, pistil.

Hazleton, city, Luzerne co., Pennsylvania, U.S.A., in the anthracite coal region, 100 m. N.W. of Philadelphia. Pop. (1900) 14,230.

Hazlitt, WILLIAM (1778-1830), English critic and essayist, born at Maidstone, Kent. He settled in London in 1812, but did not begin to be known till about 1817, when he brought out the *Characters of Shakespeare's Plays*. In 1818 he delivered his *Lectures on the English Poets*, in 1819 *Lectures on the English Comic Writers*, and in 1820 *Lectures on the Dramatic Literature of the Age of Elizabeth*. His essays were collected in the *Round Table* (with Leigh Hunt; 2 vols. 1817), *Table Talk* (2 vols. 1821-2), and the *Plain Speaker* (1826), and in the posthumous volumes edited by his son. In 1825 he published the *Spirit of the Age*, a series of portraits of contemporaries. His last three years were devoted to his *Life of Napoleon*, of whom he was an ardent admirer (1828-30). The hostility which his political views and unfortunate petulance won him during his life is largely accountable for the neglect till recently of his outstanding merits. He is in some respects the greatest of English critics; and certainly the suggestive, stimulating character of his work, and the influence which he has exerted, justify his being called 'the critics'.

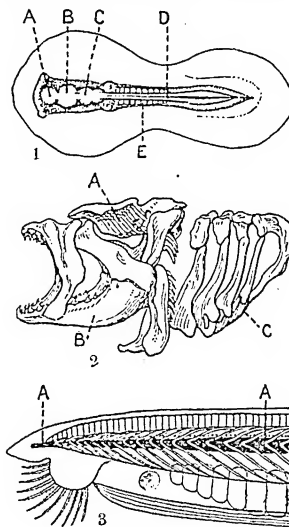
critic.' See his *Literary Remains* (2 vols. 1836); *Sketches and Essays* (1839); *Winterslow—Essays and Characters written there* (1850); *Memoirs of William Hazlitt*, by W. Carew Hazlitt (2 vols. 1867); *Four Generations of a Literary Family*, by W. C. Hazlitt (2 vols. 1897); *List of the Writings of William Hazlitt*, by Alexander Ireland (1868); *Selections* (ed. Ireland, 1889); *Essays on Poetry* (ed. Nichol Smith, 1901); and the *Collected Works*, ed. by A. R. Waller and Arnold Glover, with introduction by W. E. Henley (12 vols. 1902-4).

Hazlitt, WILLIAM CAREW (1834), English man of letters, bibliographer, and numismatist, grandson of William Hazlitt, the critic and essayist, born in London. His tastes are more particularly for rare books and ancient English poets. Among his principal works may be mentioned *Memoirs of William Hazlitt* (1867); *Hist. of the Venetian Republic* (1867; 3rd ed. 1900); *Bibliographical Collections and Notes* (1876-1904); *Dodsley's Old Plays* (1874-6); *The Lambs* (1897); *Shakespeare* (2nd ed. 1903); *Montaigne's Essays and Letters* (1902); *Our National Faiths and Customs* (1904); *Folklore, Faiths and Customs*; *Man considered in relation to God and a Church* (1905).

Hazor, three towns in Palestine. (1.) In Upper Galilee (Josh. 11:1, etc.), where the name still survives at Jebel Hadireh. It is noticed on monuments 1500-1300 B.C. (2.) Hazor of Benjamin (Neh. 11:33) is the present ruin Hazûr, near Gibeon. (3.) In the extreme S. (Josh. 15:23, etc.); was perhaps the same as Hezron (Josh. 15:3, 25). The name exists at Jebel Hadireh on the plateau W. of Petra.

Head. In all vertebrates (chordates) above amphioxus a distinct head region is present; or in other words, the anterior part of the nervous system becomes distended to form a specialized region, the brain, and this brain is surrounded and protected by a brain-box or cranium—hence the name of Craniata, applied to all vertebrates with a head. In the higher Craniata the brain-box becomes a dense bony case, the skull; but in lower forms it may be a simple trough of cartilage or gristle. The head is a segmented structure, but the skull is not. In the developing embryo the head region is first indicated by the appearance of a swelling on the anterior part of the nerve tube (medullary canal). This swelling, known as the first brain vesicle, is rapidly followed by a second and a third; and from these three vesicles the five parts of the adult vertebrate brain

originate. In connection with the first vesicle appear the two optic vesicles, which are the first rudiments of the eyes, and are very prominent in the early stages of development. The segmentation of the vertebrate embryo is early shown by the appearance of what are known as the mesoblastic somites, which are blocks of tissue forming the rudiments of the future muscles. The splitting of the mesoblast (see EMBRYOLOGY) into blocks also takes place in the head region, and affords one proof of the segmented nature of that region. At a later stage in development cartilages appear at the sides of the notochord in the region of the brain, and these constitute the rudiment of the future skull. In such vertebrates as reptiles, birds, and mammals there appear what are known as visceral arches, in reality the remains of the gill arches of the fishlike ancestors.



Development of the Head.

1, Embryo of chick: A, B, C, first, second, and third brain vesicles; D, medullary canal; E, mesoblastic somites. 2, Cartilaginous head of skate: A, brain-case; B, jaws; C, gill arches. 3, Head of amphioxus: A, notochord.

Head, BARCLAY VINCENT (1844), English numismatist, born in Ipswich, Suffolk. After being appointed keeper of the coins and medals of the British Museum (1893), he issued catalogues in connection with that department. His principal works are *Historia Numorum, a Manual of Greek Numismatics* (1887), and *Catalogues of Greek Coins in the British Museum*; he has also written on the coinage of *Syracuse* (1874), *Lydia* (1877), *Persia* (1877), and *Boeotia* (1881). He is joint-editor of the *Numismatic Chronicle*.

Head, SIR EDMUND WALKER (1805-68), born near Maidstone, Kent; was appointed poor-law commissioner in 1841, and six years later governor of New Brunswick. From 1854 to 1861 he was governor-general of Canada. He published *Ballads and other Poems* (1868), and edited a translation of Kugler's *Handbook of Painting* (1848).

Head, SIR FRANCIS BOND (1793-1875), English colonial governor and author, born near Rochester, Kent. His best work is *Bubbles from the Brunnens of Nassau* (1834). After acting as poor-law commissioner, he was appointed lieutenant-governor of Upper Canada (1835), where he suppressed a rebellion. He wrote *Rough Notes of Journeys across the Pampas and among the Andes* (1828), *Life of Bruce* (1830), and *Life of Sir J. M. Burgoyne* (1872).

Headache. Headaches are described as throbbing, aching, or shooting, sometimes compared to a feeling of constriction, and sometimes to a sense of weight. They are often associated with derangements of the special senses, such as noise in the ears, vertigo, visual spectra, as well as with sickness, wakefulness, drowsiness, and sometimes even delirium. Dr. Hughlings Jackson has pointed out that frontal headache is often referable to abdominal ailments, pain at the vertex to cerebral disturbance, and occipital headache to circulatory disorders and especially to anemia. Among the local causes are traumatism, abscess, neuritis, and derangement or disease of the organs of special sense, among which defects of vision and diseases of the ear and nose occupy a prominent place. Among the more serious local causes, disease of the cranial bones, tumours and abscesses of the brain, and abnormalities of the cerebral vessels must be remembered. The chief general conditions which lead to headache are fever, fatigue, heat, want of exercise, impure air, and such abnormal states of the blood as are produced by many drugs, or exist in anemia, kidney disease, rheumatism, and gout. A third group of causes must be described as reflex, in which headache depends on disease or disturbance of another organ, such as the liver, the stomach, the rectum, or the kidney. In women ovarian disorder is a fertile source of headache, which is often of a megrim type. In megrim (synonyms, *migraine* and *hemierania*) pain is present on only one side of the head, and is often associated with visual disturbances, which may take the form of flashes of light before the eyes, or of a blindness affecting one

side of both eyes. But megrim often arises from other causes, being frequently a form of *petit mal* or minor epilepsy.

Treatment depends entirely upon the cause. Of simple remedies, the application of cold to the head is the most important. An ice-bag or Leiter's tubes may be employed, but frequently a douche of cold water or an evaporating lotion applied to the scalp or to the forehead is sufficient. In some cases the counter-irritation of mustard or of cantharides on the nape of the neck is of service; applications of leeches to the temples, of hot water to the feet, are also useful.

Head-hunting, the practice—now, however, dying out—among the Dyaks of Borneo and other Eastern tribes, of obtaining and treasuring up the heads of their enemies. Head-hunting was at one time practised by the northern and western nations of Europe, who sometimes embalmed the heads and preserved them as heirlooms, but oftener nailed them on their houses along with the skulls and skins of beasts. See Elton's *Origins of English History* (1890), Dorothy Cator's *Everyday Life among the Head-hunters* (1905), and especially A. C. Haddon's *Head-hunters, Black, White, and Brown* (1901).

Headmasters, INCORPORATED ASSOCIATION OF, was established in 1890 and incorporated in 1895. Its membership is open to the headmasters of all (British) secondary schools which are administered under a definite form of public or corporate control. Any member of the Welsh County Schools Association may be admitted to membership. The objects of the association are (a) to facilitate the interchange of views and information on all school matters; (b) to influence public bodies connected with education; and (c) to watch and, if necessary, to suggest legislation on educational matters. Its council nominates ten members on the Joint Scholarships Board.

Headon Beds are the lowest subdivision of the English Oligocene. They are seen at Headon Hill and Whitecliff Bay, in the Isle of Wight. In their total thickness of about 140 feet they include a considerable diversity of strata, but are mostly sands and clays. Thin limestones also occur containing shells of fresh-water mollusca, especially of the genera *Limnea* and *Planorbis*. As a whole, this group was deposited in shallow areas of fresh water, though marine and brackish-water intercalations are found. On the mainland they are represented in the New Forest district by sands and clays containing marine fossils.

Head Teachers' Associations, NATIONAL FEDERATION OF, formed in 1870, has for its objects the furtherance of the cause of education generally, the providing of a ready means of communication between head teachers throughout the country, and of ascertaining and giving expression to their opinions generally.

Health. By detailed comparison among organisms of the same species a standard is fixed as an indicator of the average of function and balance of functions. This standard is the 'normal,' which, in terms of evolution, may be called the coefficient of biological efficiency in the widest sense. The form of the maintenance of the normal in each function and in the total functions constituting the organism is health. Health is characterized by certain easily-ascertained symptoms—temperature, varying from 97° to 99° F.; respirations, averaging sixteen per minute in the adult male; pulse rate, sixty to seventy in the adult male; and so on. Such departures from these normals as impair the elasticity or structure of the organism constitute disease. See PUBLIC HEALTH, SANITATION, VITAL STATISTICS, GYMNASICS, PHYSICAL TRAINING.

Health, BILL OF. See BILL OF HEALTH.

Health, BOARD OF, a board established by the English government in the early part of the 19th century to investigate and administer certain matters of sewerage, water-supply, housing, etc., etc., now included under Public Health. The term is common in the American states as the name of the state departments of public health. In England, Scotland, and Ireland the central boards of health are the local government boards; the local boards are the county district committees and town councils. In the British colonies, in particular the Australian Commonwealth, the name is still in technical use.

Health Resorts. In choosing a health resort for an invalid or for a convalescent, it is of importance to consider the nature of the illness, the idiosyncrasy of the patient, and the local conditions of such places as are within his reach. Those who suffer from pulmonary diseases such as bronchitis and asthma should winter in the south of England, or farther south still, in the Riviera, in Algeria, in Madeira, in the Canary Islands, or in Egypt. In summer a more bracing climate is desirable, such as is found in Norway, in the Highlands of Scotland, or on the Yorkshire moors. Phthisical patients require surroundings which permit them to

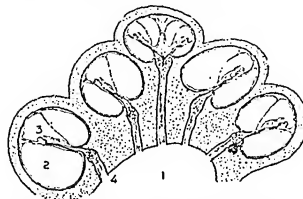
spend night and day in the open air, such as the dry, warm climate of Egypt, of California, or of Algeria, or the dry, cold atmosphere of Davos, of Denver, or of St. Moritz. Victims to gout and rheumatism generally derive benefit from a course of baths at such resorts as Buxton, Harrogate, Bath, Bridge of Allan, Strathpeffer, and many continental watering-places. Many patients with heart disease and with kidney and liver complaints improve in health under a similar course of treatment; but cardiac cases must avoid the more hilly places. For nervous prostration a yachting cruise is often of great service; but before sending a patient on a long voyage, care must be taken to ascertain that he is a good sailor.

The chief local conditions to be considered are latitude, altitude, geographical configuration, nature of soil, and facilities for invalids. (1.) Latitude is of importance, since it determines the intensity and duration of the day's sunlight. Most health resorts are in the temperate regions, and the tropics are, as a rule, unsuitable for invalids. (2.) Altitude somewhat neutralizes the effects of latitude, the temperature falling 1° F. for every three hundred feet of altitude. (3.) Proximity to the sea produces a humid atmosphere and a fairly equable temperature, which may be either raised or lowered by such ocean currents as the Gulf Stream or the Japan Current. An expanse of desert or an inland plateau accentuates extremes of temperature, and is associated with dryness of the atmosphere. Other features, such as mountain ranges and forests, modify to a very great degree both the rainfall and the prevailing winds. (4.) Soil and vegetation have important influences on health, there being a close connection between impermeability of the soil and such diseases as phthisis. At all health resorts much of the benefit received depends upon change of occupation and of scene, upon cheerful and agreeable companionship, and upon rest from ordinary occupations.

Healy, TIMOTHY MICHAEL (1855), Irish politician and lawyer, was born at Bantry. He was called to the Irish bar in 1881, made a q.c. in 1899, called to the English bar in 1902, and made a bench of King's Inns in 1905. As a debater he is alert, dexterous, resourceful, eloquent, and witty. In 1880, when correspondent of the *Irish Nation*, Parnell made him his private secretary, and he became M.P. for Wexford (1880-3). He next sat for Co. Monaghan (1883-5), for S. Londonderry (1885-6), N. Longford (1887-92).

and for N. Louth (since 1892). In 1890, in Committee Room 15, he was one of the bitterest opponents of Parnell's continued leadership. During the debates on the Land Bill (1881), Mr. Healy secured the insertion of the 'Healy Clause' (that in future no rent should be chargeable on tenants' improvements). He is the author of *A Word for Ireland* (1886).

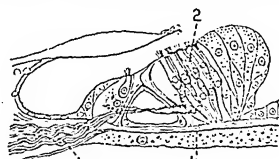
Heanor, par. and tn., Derbyshire, England, 10 m. N.W. of Nottingham; has iron works and collieries. Hosiery is manufactured. Pop. (1901) 16,249.



Diagrammatic Section through middle of Cochlea.

1. Internal auditory meatus; 2, canal of cochlea; 3, organ of Corti; 4, nerves.

Hearing. Sound waves impinging on the somewhat cup-shaped tympanic membrane of the ear set it into vibration. The vibrations are communicated to the 'canal of the cochlea,' within which lie the terminations of the nerve of hearing. These, with their supporting cells and fibres, constitute the organ of Corti, which consists essentially of a basilar membrane supporting somewhat columnar cells, which at their free end have fine hairs. Two leading theories of what happens in the cochlea are offered. First, the Helmholtz, or 'piano' theory:—The fibres of the basilar



Organ of Corti.

1. Basilar membrane; 2, columnar cells with hairs; 3, nerve endings.

membrane vary in length from the base to the top of the spiral. The lengths afford a mechanism for responding to different pitches of sound. The basilar membrane acts thus as a 'resonator' or sound-analyzer, and the nerve terminations are stimulated differently by every difference in vibration. Second, the Rutherford-Waller or 'telephone' theory:—Like a telephone plate, the organ of Corti as a whole is affected by each set of vibrations. 'Pressure patterns' are formed by different combinations of the sections of

the membrane most affected. These varied patterns stimulate the nerve terminations differently, and the brain, in its various hearing centres, interprets the resulting nerve messages. Ebbinghaus has modified Helmholtz's theory:—A tone sets in motion so many basilar fibres or strings, as when one sings a note into a piano; these strings set into motion others harmonically tuned to them. Both theories have hitherto remained unverified. The lowest audible sound contains about 30 vibrations per second, the highest about 40,000. Galton's whistle is used to estimate the degrees of audibility. The musical range includes tones from those of about 30 to those of about 3,600 vibrations per second. According to Exner, sounds are indistinguishable if they succeed each other at less intervals than 0.002 second. Differences of pitch are distinguished by good musicians if the vibrations differ by a quarter or half a wave length.

Sound sensations include noises, which are due to irregular sound vibrations; musical tones, which are due to regular vibrations; pitch, which varies according to the velocity of the vibrations; harmonic intervals, which result in the blending of two or more tones, the vibrations in one tone being a multiple of those in the other; beats and dissonance, which result when of two tones sounded together the vibrations of the one are not an exact multiple of the vibrations of the other; difference tones, incidental tones that occur when two notes within a scale are sounded together; timbre, which is the difference in quality between a note of given pitch sounded on different instruments or by different voices, the difference in quality being due to differences in the overtones, while the fundamental tone remains the same. Out of the capacity for these sense discriminations arises the response to music. Sound sensations may be acutely pleasant or painful, or massively so, thus affording immense emotional range. The perception of distance and direction of sounds is not a primary instinct; it is acquired by experience, and does not depend on sound alone. When sounds occur in the vertical plane midway between the ears, the localisation of any sound occurring impossible or in rear is practically impossible from mere differences of intensity. When sounds occur on is, as a plane, the localization the lower rule, easy. Unlike from the animals, man derives only no assistance in localizing sounds. See EAR, SOUND, ACOUSTICS.

Hearn, LAFCADIO (1850-1905), writer, was born in the Ionian Islands of Irish and Greek parentage. He became a naturalized subject of the Japanese empire, under the name of Yakumo Koizumi. Among his works are *Glimpses of Unfamiliar Japan* (1894), *Out of the East* (1895), *Japanese Inner Life* (1897),

Berks; was appointed (1701) assistant-keeper of the Bodleian Library, but resigned in 1716, though he continued to reside at Oxford until his death. Hearne's publications include *Reliquie Bodleianæ* (1703); Leland's *Itineraries* (9 vols. 1710-12); Camden's *Annals* (3 vols. 1717); *A Collection of Curious Discourses*

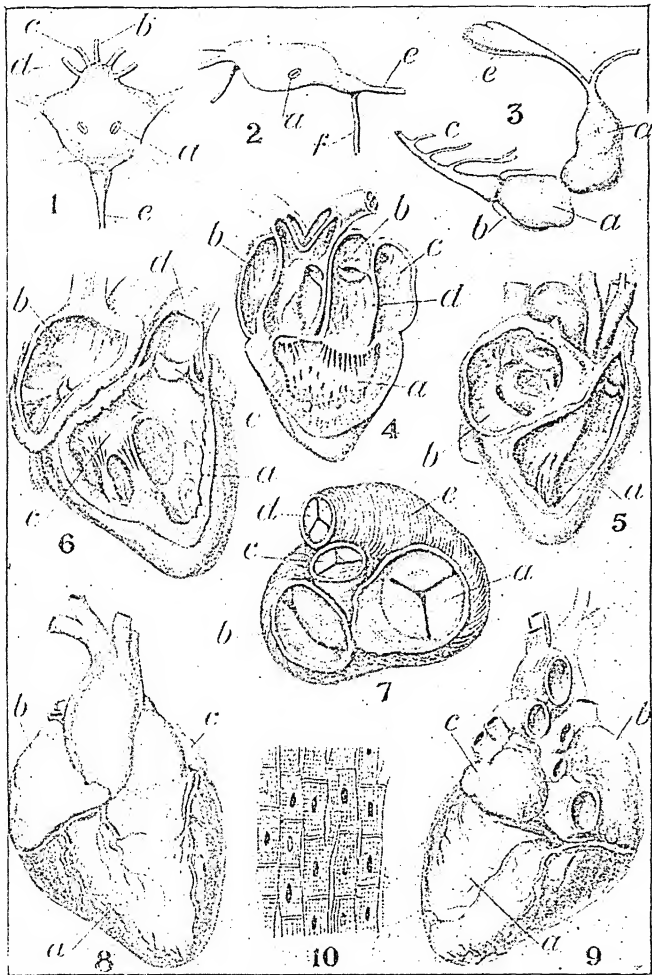
Leland and Wood (ed. by Warton and Huddesford, 1772).

Hearsay. See EVIDENCE.

Hearst, WILLIAM RANDOLPH, American newspaper proprietor, was born at San Francisco. His first paper was the *San Journal* (1895), with which he amalgamated his later purchase, the *Advertiser*. In 1900 he started the *Chicago American*, the name of which, two years later, he altered to the *Examiner*, for Chicago (morning) issue, and to the *American*, for New York (evening) issue. Mr. Hearst is a democrat; was elected to Congress in 1903; and is already (1906) spoken of as a probable candidate at the presidential election of 1908.

Heart. A heart is possessed by only some invertebrates, and in none does it attain a high degree of complexity. Unlike the same organ in vertebrate animals, the invertebrate heart always contains pure blood, and is systemic in function—i.e. it drives pure blood to the body, and is unconcerned with the propulsion of impure blood to the breathing organs. When present in annelids, the heart is merely a specially contractile portion of a blood vessel, while among the terrestrial forms of arthropods it is but little differentiated.

Among vertebrates the heart is exceedingly simple in tunicates, and is absent in amphioxus. In cyclostomes it has much the same structure as in fishes, in which it consists essentially of two chambers, an auricle and a ventricle; the former receives the venous blood from the body, and the latter drives it to the gills to be purified. Such a heart is described as branchial in function. Between the two chambers valves are placed, whose function is to permit the blood to flow in one direction only. In addition to the two main chambers, there is in fishes a swelling known as the sinus venosus, placed at the entrance to the auricle; while similarly an expansion, known as the truncus or bulbus arteriosus, is found at the point where the aorta or great artery springs from the ventricle. In the dipnoi, where lungs are present as well as gills, we have the first appearance of a division into two auricles; but the three-chambered condition is best seen in the frog, where its gradual development from the two-chambered condition of the tadpole may be traced. Here a septum appears in the middle of the auricle, dividing it into two, one half of which retains the primitive function of receiver of venous blood from the body, while the other receives the pure blood which the pulmonary veins bring back from the lungs. The ventricle remains un-



Types of Hearts.

1. Heart of crayfish, from above; 2. from left side: a, valvular aperture opening into pericardium; b, ophthalmic artery; c, antennary artery; d, hepatic artery; e, superior abdominal artery; f, sternal artery. 3. Heart of perch: a, ventricle; b, auricle; c, gill or branchial arteries; d, venous sinus; e, venous sinus of head. 4. Heart of frog: a, ventricle; b, right auricle; c, left auricle; d, interauricular septum. 5. Heart of eel: a, right ventricle; b, right auricle. 6. Heart of man: a, b, right auricle and right ventricle laid open; c, tricuspid valve; d, pulmonary artery; e, semilunar valve. 7. Base of ventricular part of human heart, showing the valves: a, tricuspid valve; b, mitral valve; c, aorta; d, pulmonary artery; e, spirally arranged fibres. 8. Human heart, anterior view. 9. Posterior view: a, right ventricle; b, right auricle; c, left auricle. 10. Striped involuntary muscle of heart, much magnified.

... on *English Antiquities* (1720); *History and Antiquities of Glastonbury* (1722); *Robert of Gloucester's Chronicle* (1724), etc. See *Memorials of his life* (1736); and his *Life*, along with those of

Shadwings (1900), *A Japanese Miscellany* (1901), *Kotto* (1902), and *Kokoro* (1905).

Hearne, THOMAS (1678-1735), English antiquary, born at Littlefield Green, White Waltham,

divided; but it now takes on a double function, for it contains both pure and venous blood, and by a complicated arrangement of valves drives the venous to the lungs, and pure (or mixed) to the body. Such a heart is at once pulmonary, or part of the lung circulation, and systemic, or part of the body circulation; but the two circulations are incompletely separated, so that in the heart there is a blending of the two kinds of blood. In reptiles a similar mingling of the two blood streams always takes place to a greater or less extent, and it is only among birds and mammals that a complete separation exists between the right or pulmonary and the left or systemic sides of the heart. Here there are two ventricles as well as two auricles.

In man the heart is a hollow, muscular organ of conical form, the apex being directed downwards, forwards, and to the left side. It is situated in the anterior part of the thoracic cavity, behind the sternum and between the lungs, being, in the adult, about 5 in. long, $3\frac{1}{2}$ broad, and $2\frac{1}{2}$ thick. It is divided by an impermeable, fibrous, mesial septum into right and left sides, and each half is further subdivided by a septum with a valvular aperture into an auricle, or receiving, and a ventricle, or propelling, chamber. While each of these four chambers is of about the same cubic capacity, they vary considerably in the thickness of their muscular walls. The auricles, having comparatively little work to perform, are relatively thin-walled; the muscle of the right ventricle is thicker, since it must propel the blood through the pulmonary vessels; that of the left ventricle is still larger and more powerful, its function being the propulsion of the blood throughout the whole body. Between the right auricle and the right ventricle lies the tricuspid valve, whose three segments are so arranged that, while they allow the blood to pass freely from auricle to ventricle, they prevent its return when the ventricle contracts. The only other opening in the right ventricle is that of the pulmonary artery, into which the blood is therefore forced by the ventricular contraction. This orifice also is provided with a valve, acting similarly to the tricuspid—i.e. allowing free passage onwards, but preventing return when the ventricle dilates. On the left side of the heart the arrangement is almost identical. The blood returns purified from the lungs, and enters the left auricle, from which the auricular contraction drives it through the orifice between auricle and ventricle into the left ventricle. The left auriculo-

ventricular opening is guarded by a valve of two segments; and it borrows its name, mitral, from its supposed resemblance to an inverted mitre. The valve is comparable to the tricuspid, in that it prevents regurgitation of blood into the auricle when the ventricle contracts, so that the systole of the left ventricle compels the blood to pass into the only available passage, the aorta. The aortic opening, like that of the pulmonary artery, has a valve of three segments, which has for its function the prevention of backward flow when the left ventricle again dilates. The pulsations of the heart are rhythmical, each consisting of (1) a simultaneous contraction of the auricles, and (2) a simultaneous contraction of the ventricles. These two contractions constitute the systole. Then follows a pause or state of rest, during which the muscle relaxes and all the chambers dilate. This is known as diastole, and occupies nearly as much time as the two contractions together. Systole and diastole make up the cardiac cycle. In a healthy adult the heart beats about seventy-five times per minute, and at each stroke drives out, from each ventricle, about $5\frac{1}{2}$ cub. in. of blood. The left ventricle exercises as much pressure per square inch as would support a column of blood 9 ft. in height, and in twenty-four hours performs an amount of work equivalent to 90 foot-tons. The work of the heart as a whole in twenty-four hours is about 120 foot-tons.

The muscle of the heart is of the involuntary type, but among muscles of this variety it is unique in being striped. It is under the control of cardiac nerves, which are derived from the cervical ganglia of the sympathetic nervous system, and its movements are therefore independent of volition. Externally the heart is covered by the pericardium, a dense fibrous mantle arranged in two layers, which enclose between them the pericardial cavity. The outer layer is in the form of a pyramidal tent pitched upon the diaphragm. The apex of the tent falls downward within the walls, so as to form a pouch in which the heart lies. The infolding of the outer layer takes place where the great vessels spring from the heart. The inner surface of the inner pericardial layer is firmly adherent to the heart muscle, and that part of the diaphragm embraced within the circle of the tent has adherent to it a continuation of the outer layer, which, as it were, forms a floor to the tent. To each other the outer and inner layers of the pericardium present smooth, glistening, serous surfaces, which secrete

a small quantity of thin pericardial fluid that acts as a lubricant, and, by diminishing friction, facilitates the cardiac movements. Internally the heart chambers are lined by the endocardium, whose serous surface in a similar way lessens the friction between the moving blood and the muscular walls. The valve segments are semilunar in shape, and are composed of folds of endothelium strengthened by enclosed fibrous tissue. The heart derives its blood supply from the coronary arteries, which spring from the aorta, and it returns its venous blood to the right auricle by the coronary veins and sinus.

Since in the foetus there is no pulmonary circulation, certain peculiarities exist in the heart of the unborn child. Chief among these is the direct communication between the two auricles by means of the foramen ovale, a large opening in the interauricular septum. A great part of the blood passes through the foramen ovale into the left auricle, from which it is driven into the left ventricle, and through the aorta to the maternal placenta, where it obtains not only nutriment, but such oxygen as is necessary during intra-uterine life.

Pathology of the Heart.—Although death from heart disease is usually due to failure of the muscle, morbid changes in other tissues generally precede abnormality of the muscular wall. Derangement of the cardiac nerves, disease of the coronary vessels, inflammation of the enveloping or lining membranes, valvular insufficiency, changes in the pulmonary or in the systemic circulations from lung or kidney disease, and morbid states of the blood, may all demand extra work from the heart muscle. Under the most favourable circumstances the heart responds to this call by an increase in the frequency and in the force of its contractions. As is the case with other muscles, increased exercise leads to growth, and, up to a certain point, hypertrophy of the heart muscle is merely nature's attempt to adapt the organ to its changed environment. For a time, should a balance be struck between the work and the power, 'compensation' is said to be established, and all may be well; but sooner or later the hypertrophied muscle is liable to suffer from malnutrition, and to undergo degenerative changes and premature senility. Like other serous membranes, the pericardium and the endocardium are liable to inflammation, especially in connection with acute rheumatism. The heart may also become diseased from morbid changes in the vessels or in the blood. In anæmia

and other wasting diseases the heart, like the other organs, suffers from lack of nutriment. Tumour, aneurism, and atheroma may occur in the heart wall, and may lead to spontaneous rupture. Injuries, such as wounds, are nearly always fatal. Congenital malformations, such as a patent foramen ovale, are not infrequent. Palpitation, irregularity of the pulse, and breathlessness on exertion are common in nearly all heart affections. Fainting is often caused by the cardiac weakness of anemia, but is of the gravest significance when occurring in association with aortic disease, the form of cardiac derangement which most frequently leads to sudden death.

The chief therapeutic agent in diseases of the heart is rest, and the term must be understood in its widest sense. Violent exercise of mind and of body, and excitement and worry of all kinds, must be avoided by a patient with heart disease. In addition, measures must be taken to diminish, as far as possible, the strain upon the damaged organ by lowering arterial tension and by improving the bodily health. In all cases the patient suffering from heart disease should put himself under the most favourable hygienic conditions, by giving up business, by residing in a genial climate, by keeping early hours, and leading a regular life, with moderate, gentle exercise and wholesome, unstimulating food.

Heart-burial, or the burial of the heart in a separate place from that in which the body is laid, was a not uncommon practice in the middle ages, chiefly in the case of persons of high rank or high birth, though the custom has continued down to the present day. The hearts of Henry II. and Henry III. of England were buried at Fontevraud, that of Richard I. at Rouen. Jerusalem was the place of burial of the heart of Edward I.; Robert Bruce desired his to go there; and the Marquis of Bute, who died in 1900, had his heart buried on the Mount of Olives. Separate burial was given to the hearts of Louis XII., Louis XIII., Louis XIV., of Francis I. and Francis II., and of Henry II. and Henry III., kings of France, and of the Emperor Leopold. The Irish agitator Daniel O'Connell bequeathed his heart to Rome; and there, too, Shelley's heart was buried under the brief but pregnant inscription, '*Cor cordium*.' The heart of the French marshal Kellermann was buried on the battlefield of Valmy; Lord Byron's in a special mausoleum at Missolonghi in Greece; Livingstone's heart under a great tree at Ilala, south-east of Lake Bangweolo, S. Africa; Kosci-

uszko's near Solothurn (his body at Cracow); and Gambetta's at Ville d'Avray, near Versailles, his brain in Paris, and his body at Nice. See further instances in Chambers's *Book of Days*, ii. p. 414, etc.; Hartshorne's *Enshrined Hearts* (1861).

Heartburn (syn. *cardialgia*), a popular name for pain or discomfort caused by irritation of the stomach. It is usually felt as a hot, burning pain at the upper part of the gullet, and is often accompanied by a feeling of weight in the region of the heart, as well as by eructations of gas and of sour acid fluid. It is generally due to gastric catarrh, and to errors in diet, and as a rule it yields to simple gastric sedatives such as bismuth, charcoal, and hydrocyanic acid, along with regulation of the bowels and the diet.

Hearth-money, a tax which appears to have been imposed as early as Anglo-Saxon times, but was reimposed after the restoration (1662) to take the place of the old subsidies. But as it bore heavily on the poor (2s. per hearth), and involved inquisitorial visits from officials known as 'chimney-men,' it became very unpopular, and was repealed in 1689.

Heart's Content, seapt. tn. in Avalon Peninsula, Newfoundland, on E. side of Trinity Bay, 40 m. N.W. of St. Johns; is the terminus of three Atlantic cables. It has an excellent harbour. Pop. (1901) 1,079.

Heart's-ease. See PANSY.

Heat. When we use the words hot and cold, we implicitly regard ourselves as the standard of comparison; but if we try to form a scale of degrees of hotness, and classify substances accordingly, we soon encounter difficulties. Ice, boiling water, molten lead, a gas flame, an electric light, the sun, are easily recognized to form such a series; but it is impossible by means of our senses alone to compare in any exact way the 'ascents' of hotness between the successive pairs. Another familiar experience is that, when a hot and a cold body are placed together, the hot body cools, and the cold body grows warm. This means a transference of heat from the one body to the other; but this process will not go on indefinitely. The two bodies will ultimately come to what might be termed the same degree of hotness. But some confusion might arise from the use of this phrase; for it is well known that the blade of a knife, under ordinary circumstances, feels colder than the wooden handle; and yet there is not the least doubt that neither is parting with heat to the other. Hence the necessity

for the introduction of the scientific term *temperature* to express the relative condition of bodies as regards the transference of heat from one to the other. Thus, when bodies are at the same temperature, there is no transference of heat from one to the other. On the other hand, when there is a transference of heat, there must be a difference of temperature, and the heat passes from the body at the higher temperature to the body at the lower temperature.

In order to determine which of two bodies is at the higher temperature, we require some method of indicating whether a body is losing or gaining heat. For this purpose we appeal to some measurable physical quality which alters in a definite manner when heat is given to or taken from the body; and the particular quality most commonly made use of is the volume of a fluid. In general, the application of heat to a body is accompanied by a rise of temperature and by an increase of volume; and practically it is by means of this increase of volume in the case of the fluid mercury that we usually indicate and measure rise of temperature. Any instrument which indicates change of temperature by the measured change of some physical quality is called a thermometer.

When we place an ordinary mercurial thermometer in contact with a particular body, the column of mercury will rise or fall, or remain steady, according as the mercury is taking in heat, or giving out heat, or doing neither—that is, according as the body is at a higher, or a lower, or at the same temperature. What is really measured in this case is the volume of the thermometric substance: we assume that each volume corresponds to a definite temperature; and we might easily form an arbitrary scale of temperature by marking off definite increments of volume as the mercury column ascends the tube of the thermometer.

If we place this thermometer in a mixture of ice and water, we find that the mercury column always stands at the same height. When we apply heat to the ice and water and keep the mixture well stirred, the mercury column remains still at the same height, and not until the ice is wholly melted will the mercury begin to ascend as heat is applied to the water. From this experiment we learn two important facts—(1) the temperature of melting ice is always the same under the same conditions; (2) heat applied to a melting substance does not raise the temperature of that substance. Thus heat does not al-

ways produce 'warmth.' By a similar experiment we may prove that the steam which comes off from boiling water at a given atmospheric pressure has always the same temperature—the temperature, namely, of boiling water; and the application of heat to this boiling water will produce no rise of temperature.

These experiments give us two definite temperatures which may be reproduced at any time, and they therefore form convenient standard temperatures on which to base a scientific thermometric scale.

The fact that heat is used up in changing a solid into a liquid and a liquid into a gas gives a clue as to the real nature of heat. For these states of a substance differ from one another in the degree of mutual constraint of the particles or molecules which compose the substance. One effect of heat is, then, to break down the constraints, to overcome intermolecular forces—that is, to do work. (See ENERGY.) The gaseous molecules have greater energy of motion than the liquid molecules, and these, again, greater energy than the molecules in the constrained solid state. Hence the absorption of heat, say, in transforming a pound of boiling water into steam is accompanied by an increase in the energy of motion of the molecules. Energy has appeared in the form of the motion of masses; it has disappeared in the form of heat. Heat, in short, is energy. Once this great truth is grasped, all phenomena connected with the production and absorption of heat become readily intelligible.

The same conclusion is forced upon us when we consider the various ways in which heat may be produced. The most familiar method of producing heat is by combustion, a process which involves chemical action, with the formation of a new compound substance. There has been a change in the molecular constitution of the matter, and what previously existed as potential energy in the substances is changed into heat. A simpler case is the production of heat by friction or concussion. In these cases we know that work has been done in overcoming the frictional force, or that energy of motion has been lost by the impact of one body on the other. With a delicate thermometer there is no difficulty in demonstrating that two pieces of wood rubbed briskly together become raised in temperature. The method is used by uncivilized peoples to generate fire. Again, in the spark produced by the impact of flint and steel we have

evidence of the generation of heat; and when any rapidly moving body is brought quickly to rest, heat is produced. For example, a meteor becomes visible to us as a falling star when, in its rapid flight through space, it gets entangled in our atmosphere. In overcoming the resistance of the air it loses energy of motion, and has its temperature raised to white heat. The heat produced at the axles of wheels is another illustration. In brief, whenever mechanical energy is lost to a system, a certain amount of heat is always produced; and there is a definite relation between the mechanical energy lost and the heat produced. This great truth was established by Joule, who proved that the amount of heat required to raise a pound of water 1° F. in temperature was equivalent to 779 foot-lbs. of work. This number is called Joule's dynamical equivalent of heat.

There is no difficulty in transforming a given amount of mechanical energy into heat; but when we try to reverse the process, and change a given supply of heat into mechanical work, we find that it is impossible wholly to effect the transformation. Before work can be got from heat, we must have two bodies at different temperatures. The heat must pass from the body at the higher temperature to the body at the lower temperature. Thus, in the steam-engine there must be a boiler and a condenser at different temperatures. Now, in the best possible engine some of the heat supplied by the boiler must be given to the condenser; hence only a part of the heat supplied is available for transformation into useful mechanical work. It was this fact which led Lord Kelvin to his definition of absolute temperature, or rather, to the definition of a scale of temperature depending only upon energy relations, and quite independent of the properties of any special thermometric substance such as mercury, spirit of wine, air, hydrogen. When as much work as is theoretically possible is being obtained from a heat-engine working between given temperatures of boiler and condenser, the temperatures of these bodies are defined to be in the ratio of the heat given up by the boiler to the heat taken in by the condenser during any complete cycle of operations. The theory indicates an absolute zero of temperature, at which the condenser must be if all the heat supplied is to be transformed into mechanical work. This zero is 493° below the freezing-point of water on the Fahrenheit scale, and 673° below the

boiling-point. See also THERMODYNAMICS.

Now, it is found by experiment that this absolute scale agrees very well with the scale constructed upon the law of expansion of air, oxygen, hydrogen, etc. Thus, 493 cub. in. of air, at the freezing-point and at a given pressure, become almost exactly 673° when the temperature is raised to the boiling-point, the pressure being kept constant. Hence, practically, we may use the scale given, say, by equal increments of hydrogen gas at constant pressure as one which is in close agreement with Lord Kelvin's absolute scale. By adding 461° to the Fahrenheit measure of temperature, or by adding 274° to the centigrade measure of temperature, we obtain the equivalent number on the absolute scale. Let T be this absolute temperature, and let p and v be the pressure and volume of a mass of gas. Then we find that the ratio $\frac{pv}{T}$ is very approxi-

mately the same, whatever be the individual values of p , v , and T .

Another way of stating this important law is that the product of the pressure and volume of a gas is proportional to the absolute temperature. Were the gas to retain the same properties down to the lowest temperatures, its pressure or volume, or both, would vanish at the absolute zero. But so far as our knowledge goes, the substance ceases to be a gas before the absolute zero is reached. Indeed, this lowest theoretical temperature has not been touched, although Dewar, in his experiments on the liquefaction of gases, has reached to within 30° (Fahrenheit scale) of it.

When, by the abstraction of heat from a gas and the increase of pressure, the substance becomes either liquid or solid, the density is greatly increased, and the particles of the substance are brought much closer together. This is true not only of substances which are gaseous at ordinary temperatures, but also of substances—such as iron, sulphur, or mercury—which are solid or liquid at ordinary temperatures. The difference is one of degree, not of kind. In all cases, the lower the temperature, the further removed from the gaseous state, or the nearer the solid state; and the higher the temperature, the further removed from the solid state, or the nearer to the gaseous state. Now, when the substance is changing state from solid to liquid or from liquid to gaseous, the heat supplied is not increasing temperature, but is being transformed into molecular energy. When, however, the substance is

not changing state, the addition of heat in general means a rise of temperature. In the case of a solid such as iron the temperature may rise to such an extent as to make the substance self-luminous. Moreover, long before it is giving out rays of light it is emitting non-luminous rays of so-called radiant heat. (See RADIANT ENERGY.) These, like the rays of light, are propagated through the surrounding medium as waves, and their undoubted undulatory character almost of necessity implies that the particles of the radiating solid are themselves in a state of vibration. The same is true of hot liquids and hot gases. In the case of highly-heated gases a few rays of definite wave-length are given off (see SPECTRUM), showing that the particles vibrate freely in a few simple modes of vibration. In the case of the luminous solid, on the other hand, the constraints of the molecules compel vibrations of almost all wave-lengths within certain limits.

All these facts go to show that rise of temperature is associated with increased energy of vibration of the molecules which constitute the substance. And thus we come to recognize heat as the energy of molecular vibrations. Every molecular group is in a state of agitation, and is capable of communicating similar motions to neighbouring groups. This, no doubt, is the process by which heat is conducted through a substance. (See CONDUCTION.) When a particular group is passing on to contiguous groups as much energy on the average as it is receiving from these groups, there is thermal equilibrium, and all are at the same temperature. There is an interchange of energy between contiguous groups even when they are at the same temperature, but, on the whole, each group receives as much as it gives out. A group which receives more than it gives out is gaining energy, and this gain is accompanied by changes of volume, pressure, or form, from which we infer an accession of heat involving a rise of temperature. The molecules also, by their vibrations, act on the ether, through which the energy is transmitted in the form of wave motion.

The tendency of heat is to pass from the body at the higher temperature to the body at the lower temperature; and there is no material known which is able to act as a perfect non-conductor. Thus, it is impossible for a region to remain indefinitely at a higher or a lower temperature than surrounding regions. Herein lies the great difficulty of obtaining either a very hot or a very cold body. The highest artificial tempera-

tures are now got by means of the electric furnace; but to sustain these high temperatures, a great amount of energy is lost by the processes of conduction, convection, and radiation. In like manner, to reach very low temperatures a large amount of work must be done in compelling physical changes which produce a great absorption of heat. The cooling effect due to an imposed physical change may be illustrated in various ways. The simplest is perhaps the cooling due to evaporation. Evaporation means the transformation of a liquid into a vapour, in which form the particles have a greater energy of motion. If the region above the surface of a liquid is kept as free from the vapour as possible, the vapour will evaporate from the liquid surface. But this means increased energy, and the heat necessary to supply this energy is taken out of the matter in the neighbourhood. This matter, including the evaporating liquid itself, is accordingly cooled. Similarly, when a gas is allowed to expand suddenly into a partial vacuum, the work done by the expanding gas means an absorption of energy. The gas itself loses energy in the form of heat, and the temperature falls. It is by a skilful use of these two methods that experimenters have in recent years obtained temperatures low enough for the liquefaction of air, oxygen, and hydrogen. Essentially the same in principle is the action of freezing mixtures. A physical state is induced which requires absorption of energy, and this is accomplished at the expense of heat in the substances forming the mixture. There are good text-books by Balfour Stewart (1895), Maxwell (1894), Tait (1884), and Preston (1904). See HEAT OF FORMATION.

Heather, or **HEATH**, the common name for the plants belonging to two genera of the order Ericaceæ. See CALLUNA and ERICA.

Heathfield, **GEORGE AUGUSTUS ELLIOTT, LORD** (1717-90), British general, born at Stobs, co. Roxburgh; fought at Dettingen and Fontenoy, and through the German campaign of 1759-61. Then he greatly distinguished himself in Cuba (1762). His greatest exploit was the heroic defence of Gibraltar, begun in July 1779, and lasting until February 1783, when Admiral Lord Howe succeeded in breaking the blockade. In 1787 Elliott was created Lord Heathfield of Gibraltar. See Drinkwater's classic, *Two Sieges of Gibraltar* (last ed. 1844).

Heating. In most countries the outside temperature frequently falls considerably below the

standard required for comfort, and buildings have to be heated artificially. This may be done by the use of open fires, stoves, high-pressure hot-water heating, low-pressure hot-water heating, or by the use of hot air.

Open Fires.—The most widely used system of artificial heating is by a fire of coal, peat, or wood enclosed in some form of grate. To give the best results, the sides of the grates should be set at an angle of about 130° to the back, the depth of the grate should equal the width of the back, and the back of the grate should project outwards at the top. Gas fires, which consist of an arrangement of burners playing on asbestos or some refractory clay, are useful in places where a fire is not constantly required.

Stoves.—In many countries stoves are almost universally used. They have the advantage of economy of fuel, but are not so satisfactory from a hygienic standpoint as the open fire, as there is a tendency for any iron stove or flue to become spongy after lengthened use, and this condition allows carbon monoxide to percolate through.

High-pressure Hot-water Heating.—In this system a fire is used to heat water, confined in strong metal pipes, to a high temperature and considerable pressure. The apparatus consists essentially of a boiler, or, as is often the case, a coil of pipe to which the heat is applied, and to which are connected the circulating pipes (of small diameter) and radiators, generally of ornamental design, to give a sufficient radiating surface. At the highest point of the system an expansion pipe or vessel is placed, and is closed hermetically. The capacity of this expansion vessel should be equal to about one-tenth of the capacity of the whole apparatus, including the boiler. The circulating pipes for conveying the heat to the various places where it is required are usually of wrought iron. The outside diameter is between one and a quarter and one and a half inches, while the inside diameter is seven-eighths of an inch. The working pressure of a system like this may be anything from 50 to 500 pounds per square inch, and the pipes used are tested to from 1,000 to 3,000 pounds per square inch by hydraulic pressure. By a modification of this system railway carriages are now heated by the exhaust steam from the brake pump or by steam from the boiler.

Low-pressure Hot-water Heating.—This system has the same essentials as the other—viz. boiler, circulating pipes, and expansion pipe or vessel. The boiler is always a separate vessel, generally made of cast or wrought iron.

The pipes are cast iron, and the inside diameter is not usually less than four inches. The difference in level between the expansion tank and the boiler determines the pressure which is put on the apparatus. The temperature of the water in this system rarely rises above 200° F. Air-cocks should be placed at all points where air is likely to accumulate, such as the top of coils and radiators, as otherwise the pipes would get air-logged and impede the circulation. The circulatory system may be briefly described. Between the freezing and boiling points water increases in bulk 1 in 24; the heated water therefore rises to the surface of the boiler. In domestic supply, a flow-pipe is carried from the top of the boiler upwards to the supply tank, having its outflow about one-fourth from the top of the latter. From the bottom of the supply tank the return pipe is led directly back to the boiler, with an outflow near the bottom. A cold-water supply pipe is carried from the cistern to the supply tank, which it enters at the bottom. Various rules are given by authorities to determine the amount of piping required, but so much depends on the site and aspect of the building or rooms to be heated and on the area of windows, etc., that no rule can be applied universally. Jones gives the following as an average:—For public buildings and workshops where the desired temperature is 55° F., 6 to 7 ft. of 4-in. pipe is required per 1,000 cub. ft.; for shops and waiting-rooms where the desired temperature is 60° F., and for living-rooms to have a temperature of 65° F., 10 to 11 ft. of 4-in. pipe; while for greenhouses to have a temperature of 45° to 50° F., 35 ft. of 4-in. pipe per 1,000 cub. ft. are necessary.

Heating by Hot Air.—This method is the same in principle as heating by a stove. The furnace usually consists of an inner case in which fuel is burned, and the air is warmed by circulating between the inner and outer cases. From this space the hot air is carried by pipes to the various rooms, and is admitted by a regulator. Fresh air is taken in to the heater through a pipe led to the exterior of the building. This method also ensures efficient ventilation if the air-supply is taken from a pure source.

See Dye's *Hot-water Supply* (1902), Jones's *Heating by Hot Water* (1890), Hood's and Kirtledge's *Warming and Ventilating Buildings* (1879), and Baldwin's *Hot-water Heating and Fitting* (1889). See also BOILERS; FURNACES; VENTILATION; and, for electric heaters, see ELECTRIC LIGHTING.

Heat of Formation. When chemical compounds are formed, heat is as a rule evolved, the quantity being very large in such cases as combustion, small in other cases, and negative in others. The quantity is determined by carrying out the reaction in a calorimeter, so that a known mass of water is heated, the product of the mass of water into its rise of temperature giving the quantity of heat received. In some cases, where the heat of formation cannot be determined directly, it can often be calculated indirectly through the fact that the quantity of heat evolved or absorbed in the formation of the compound is quite independent of the stages it may have gone through. Thus, the heat of formation of methane from carbon and hydrogen can be found from the difference in heat given out when methane is burned, and when the same weights of free carbon and hydrogen are also burned, the latter not having gone through the intermediate stage of formation into methane.

Heaton, RIGHT HON. JOHN HENNIKER (1848), English politician, born at Rochester; M.P. for Canterbury since 1885; is noted for many reforms in the postal service. Of sixty reforms which he tabulated in 1885, no fewer than forty have been carried into effect, largely as a result of his persistence. The chief of these are the parcel post to France (1887), telegraphic money orders (1889), and reduction of postal rates to India and Australia (1890). He has always been a strenuous advocate of an imperial penny postage, a motion in favour of which he carried in the House of Commons in 1898. Mr. Heaton is a great chess player.

Heaton Norris, tn. and tnship. in the bor. of Stockport, Lancashire, England, and connected with Stockport by a bridge of eleven arches over the Mersey and by the L.&N.W. Ry. viaduct. The manufactures include iron, cotton, thread, and hats. Pop. of tn. (1901) 9,474.

Heat-stroke. See SUNSTROKE. **Heaven,** the place of supreme bliss, the abode of God, the angels, and of men made perfect. It is in particular to the Hebrew people that we owe the almost ineradicable belief that the Deity lives above. In the Greek and Roman religions heaven is the dwelling-place of the higher gods; but the place of reward for good men is usually placed somewhere upon the earth. Thus, Hesiod speaks of the islands of the blest as the destined home of the just, Pindar assigns to them the Elysian fields in the remote west, while Virgil places them under the earth. Other

pagan writers, however, believed that the locality of departed spirits was in the air, among the stars, or upon the sun. The blessedness of these abodes was usually of a more or less sensuous kind. Not even in the Hebrew scriptures is heaven regarded as the ultimate home of the godly. *Shamayim* (a dual form) signifies the upper half of the world—i.e. the atmospheric region, and the firmament in which the sun, moon, and stars move (Gen. 1 : 6 f.); it is the high and holy place where God dwells (Isa. 57 : 15)—always, however, an actual section of the world, which at its remotest outstretch cannot contain Him (1 Kings 8 : 27), and which, with all its permanence, will give place to something better (Isa. 65 : 17). Good men and bad alike go to Sheol (see HELL); and it is a striking proof of the essential spirituality of the Hebrew religion that the few passages which speak of, or rather hint at, an immortality for the righteous, express a longing for continued communion with God, rather than for a mere place of reward (Ps. 16 : 10, 11; 17 : 15). In the New Testament the idea of locality recedes more and more into the background, though it does not entirely disappear: thus, Christ is received up into heaven (Acts 1 : 9, 10), but heaven becomes increasingly a spiritualized conception; it is the supramundane state of realized aspirations, transfigured lives, and abundant recompense, in which the ransomed see God (1 Pet. 1 : 4; Matt. 6 : 20; Rev. 7 : 9-17; 22 : 3-5), who is the sum and centre of its felicity. It is doubtful if the notion of a plurality of heavens is in the legitimate line of Jewish or Christian thought. The 'seven heavens' found in the Slavonic *Book of Enoch*, and the *Testaments of the Twelve Patriarchs*, and derived from the Persians (ultimately from the seven planets of antiquity), certainly reappear in the Gnostic and Christian apocalyptic books, and in certain of the fathers (e.g. Clement of Alexandria), but find no support in Scripture other than the use of the plural form 'heavens' (O.T. and N.T.), and Paul's 'third heaven' (2 Cor. 12 : 2). See PARADISE, and VALHALLA.

Heaves, or BROKEN WIND. See HORSES, DISEASES OF.

Hebbel, FRIEDRICH (1813-63), German poet, born in Ditmarschen (Schleswig-Holstein), and settled at Vienna (1846). Besides his *Gedichte* (2 vols. 1842 and 1848), chiefly lyrical, he wrote a number of dramas, the best of which are *Judith* (1841), *Maria Magdalena* (1844), *Agnes Bernauer* (1855), and his masterpiece

Die Nibelungen (1862; 3rd ed. 1874). Vigorous dramatic action and powerful dialogue characterize his plays, but there is a lack of repose and charm. *Sämmtliche Werke*, ed. by R. M. Werner (1901; 3rd ed. 1904). See *Lives* by Frankl (1884) and Werner (1904).

Hebburn, tn. and par., Durham, England, on s. bk. of Tyne, 4 m. N.E. of Gateshead; has shipbuilding and engineering works, and manufactures of cement and chemicals. Pop. (1901) 20,901.

Hebden Bridge, tn. and stn., W. Riding, Yorkshire, England, on the Calder, 8 m. W. by N. of Halifax; has manufactures of cottons and ready-made clothing. There are dye works and foundries. The Hebden Bridge Fustian Manufacturing Society is remarkable in the history of productive co-operation. It originated in 1870. Pop. (1901) 7,536.

Hebdomadal Board or Council, THE, is one of the governing bodies of Oxford University. It is composed of certain officials (chancellor, vice-chancellor, ex-vice-chancellor, and proctors) and eighteen members elected by Congregation (six heads of houses, six professors, and six graduates, the last being members of Convocation), and is specially chosen for the regulation of the business of the university. Its proposals are subject to emendation, confirmation, or rejection by the Congregation, and to confirmation or rejection by Convocation. As its name implies, it meets once a week in term-time.

Hebe, in Greek mythology, the daughter of Zeus and Hera, was the goddess of youth, and waited on the gods as cup-bearer before Ganymede. When Hercules was exalted to heaven, she was given him as his wife. The Romans worshipped her under the name of Juventas.

Hebel, JOHANN PETER (1760-1826), Swiss-German poet, born at Basel; became professor at the Karlsruhe gymnasium (1791), and held various ecclesiastical preferments. His *Allemannische Gedichte* (3rd ed. 1827) were written in a S. German dialect, but were translated into High German by Reinick (7th ed. 1891). His popular tales, *Der rheinländische Hausfreund* (1808-11) and *Das Schatzkästlein des rheinländischen Hausfreundes* (1811), are among the best in the German language. See *Life*, in German, by Schullheiss (1831), and Längin (1876).

Heber, REGINALD (1783-1826), second bishop of Calcutta, born at Malpas, Cheshire; became rector of Hodnet (1807), and prebendary of St. Asaph (1812). He published his first volume of *Hymns* in 1812, including 'From Greenland's Icy Mountains' and 'Lo, He Comes,' was Bampton

lecturer (1815), and preacher at Lincoln's Inn (1822). He was appointed to the see of Calcutta (1823). His other chief works are an edition of *Jeremy Taylor* (1822), and a *Journey through India* (1828). See *Some Account of the Life of Reginald Heber* (1829); *Life* by his widow, A. Heber (2 vols. 1830).

Hébert, JACQUES RENÉ (1757-94), French revolutionist, commonly known as 'Père Duchesne.' Born at Alençon, he went to Paris, and in 1790 published his first pamphlet, *La Lanterne Magique*. About the same time he founded *Le Père Duchesne* (1790-4), written in the vulgarest style, and advocating extremist views. A member of the Cordeliers Club and of the commune (1792), he was zealous against the Girondists, and favoured the September massacres. In 1794 he denounced Robespierre, who arrested him and had him guillotined. See Tridan's *Les Hébertistes* (1864), and Brunet's *Le Père Duchesne d'Hébert* (1857).

Hebrew Language, THE, the original language of the Old Testament and of several books of the Apocrypha, is one of the Semitic family of tongues, belonging to the middle or Canaanite branch, and differing only dialectically from Phœnician and Moabitish. The word Hebrew does not occur in the Old Testament, its place being taken by 'the lip (i.e. tongue) of Canaan' in Isa. 19:18, and by *Jehudith* (i.e. Jewish) in Isa. 36:11, Neh. 13:24, etc.; but it was evidently used in the prologue of Ecclesiasticus. In the New Testament it often stands for Aramaic (John 5:2, Acts 21:40, etc.), but was used in the proper sense by the Palestinian rabbis. Hebrew has, in common with the other Semitic languages, the following distinctive features: the vast majority of its roots have three consonants; it has remarkable capacity of internal inflection of its words; its verbs have two tenses only—perfect and imperfect; except in proper names, it does not form compounds; while, as regards syntax, its prevailing clause-construction is the succession of simple sentences joined together by the particle *wē*, 'and.' But the most striking peculiarity of Hebrew is its employment of *wē* (with varying vowel) as a prefix to the finite verb, which under certain conditions changes the ordinary meanings of the perfect and imperfect into future and past respectively—a usage, known as *waw* (or *vav*) *consecutive*, which is found in no other language except Moabitish and Phœnician, and which, indeed, has been rejected altogether, as a learned superstition (see Young's *Lit. Trans.* of

the Bible, Prefaces). It is written from right to left, and originally employed an angular script, still seen in the Moabite stone and the Siloam inscription, which, however, gradually gave way to the square character now used in printed Hebrew Bibles. At first the vowel-sounds were not represented at all, or only partially—by certain of the weaker consonants; but Hebrew as now printed, while retaining vestiges of this inefficient device, is fully vocalized by a system of dots and dashes, which, like the vowel-marks of Pitman's phonography, do not interfere with the consonantal text. This is known as the Massoretic punctuation, and is believed to have been gradually evolved about the 6th or 7th century A.D. It has served so far to fix the meaning of the text, but, while remarkably complete, cannot be considered as a faithful record of the ancient pronunciation.

The literature of which this language is the vehicle is comprised almost entirely in the Old Testament. Certain parts of the Old Testament are, indeed, written in Aramaic (often erroneously called Chaldee)—viz. Dan. 2:4 to 7:28; Ezra 4:8 to 6:18; 7:12-26; and Jer. 10:11; while the Moabite stone and the Siloam inscription, though of great linguistic interest, can hardly be said to be additions to the literature. Now as, on the very lowest estimate, the Old Testament represents a literary activity of nearly a thousand years, it is but reasonable to suppose that the language of the earlier works would be considerably different from that of the later; while, on other grounds, the probable existence of local dialects might be expected to show itself in diversity of diction among the various books. But neither of these surmises can be said to find much verification in our extant Hebrew text. The most ancient documents (whether determined as such by tradition or by modern criticism) and the youngest are remarkably similar in the general cast of their language, and certainly show nothing corresponding to the difference between Homer and Plato, or Chaucer and Shakespeare; and though we know that the Ephraimites could not give the proper (Gileadite) sound of the letter *shin* in Shibboleth (Judg. 12:6), yet all attempts to distinguish dialects in our extant books have failed. This remarkable uniformity, while doubtless testifying to the comparative stability of the language, is in part to be explained by the hypothesis of a continuous process of revision and modernizing of the documents, which

may have gone on till well into our era. Still, in spite of this levelling tendency, there remain certain diversities, particularly in the vocabulary, which have not been eliminated, and these serve to distinguish two great periods in the history of the language, sometimes called the golden and silver ages respectively, roughly separated by the return from the exile. To the former belong, without doubt, the older strata in the Hexateuch, and the greater prophets; to the latter, almost as indubitably, Chronicles-Ezra-Nehemiah, Ecclesiastes, and Daniel, all of which use a considerable admixture of Aramaic or Persian words, and therefore belong to the period when the language of the Jews was gradually giving way before that of their Aramaic-speaking neighbours. In course of time the use of Hebrew among the common people completely died out, so that the synagogue readings of the ancient Scriptures had to be made intelligible by an Aramaic rendering—the origin of the Targums. The old language continued to be cultivated in learned (i.e. rabbinical) circles among the Jews, and the great products of their peculiar scholarship are the Midrash, the Mishna, and the Talmud; and to this day books and newspapers are published and letters written in the rabbinical tongue.

The best all-round Hebrew grammar is that of Gesenius (27th ed. by Kantsch, 1902; trans. Oxford); others by Ewald (8th ed. 1870), Olshausen (1861), Stade (1892), König (1881-97), Strack (trans.); in English, A. B. Davidson (excellent simplified introduction), Low, Green (1861). Dictionaries by Gesenius (13th ed. 1899; trans. by Tregelles, also useful abridged ed.), Fürst (3rd ed. 1876), Siegfried and Stade (1892); the *Oxford Hebrew Lexicon*—not yet complete—is based on Gesenius. Aramaic grammars by Petermann (1837), Marti (1896); modern Hebrew by Strack and Siegfried (1894).

Hebrews, EPISTLE TO THE, one of the most important New Testament writings, standing at the close of the Pauline group of letters, and forming what may be called the first literary apology of Christianity. (See **APOLOGETICS**.) Its all-pervading theme is Jesus Christ and the new dispensation, and its purpose is to make manifest the superiority of these over the representative personages and characteristic functions of the old order, so that the readers may be preserved against any tendency to apostasy. The letter, as we have it, lacks the customary address and greeting, and plunges at once *in medias res*.

The writer of Hebrews stands among the highest of the New Testament writers; he has rich diction, philosophic grasp, deep earnestness, and penetrating religious insight, and his theology forms a distinct type to be placed alongside that of Paul and John. Though we may infer that he was a Jew, equally well versed in his own literature and in Greek modes of thought, we have no clue to his identity, except that he was not Paul, though the apostle's name still heads the epistle in the Revised Version. The names of Luke (as the interpreter of Paul), Clement of Rome, Silas, Barnabas, and Apollos have each been proposed; Barnabas is indicated by Tertullian; but if Luther's guess of Apollos had the slightest traditional or historical support, he would probably win the suffrages of the majority of modern critics. The most recent hypothesis is that of Harnack, who assigns the epistle to Aquila and Priscilla (see *Expos. Times*, xi. 347). We are in similar uncertainty as to its destination. Its oldest address is 'to the Hebrews,' but this does not mean Jews or Christian Jews in general, but an individual Jewish-Christian church, though some (e.g. Von Soden) believe it to have been addressed to a Gentile community. Jerusalem, Alexandria, Rome, and Antioch have each its advocates, but probably the last named or some other town in Syria is least open to objection. The date of composition is usually placed about A.D. 70, just before the fall of Jerusalem. Commentaries by Delitzsch (trans.), Westcott (1892), Rendall (1888), Vaughan (1891), Von Soden in *Handkommentar* (1899), A. B. Davidson (Clark's Bible Class Handbooks).

Hebrews, GOSPEL ACCORDING TO THE, an apocryphal work, no longer extant, which was held in high esteem among the Jewish Christians (Nazarenes and Ebionites) of the 2nd century, and which has played no unimportant rôle in modern New Testament criticism. Jerome, who translated it into Greek and Latin, regarded it as the Aramaic original of Matthew. See Nicholson's *Gospel according to Hebrews* (1879); also **APOCRYPHA**.

Hebrides, or **WESTERN ISLANDS**, off the W. coast of Scotland, stretching 200 m. from the Butt of Lewis to the peninsula of Kintyre, and including St. Kilda, 50 m. W. The Outer Hebrides are separated from the mainland by the Minch, and from the N. islands of the Inner Hebrides by the Little Minch. The chief islands in the outer group are Lewis-Harris (forming one island), N. Uist, Benbecula, S. Uist, and

Barra. The only important town is Stornoway, on the E. side of Lewis. The Inner Hebrides are separated from the mainland by the Sounds of Sleat, Mull, and Jura. The chief islands are Skye, Rum, Eigg (the former the largest and the most rugged), Coll, Tiree, Mull, Staffa, Iona, Colonsay, Jura, and Islay.

The islands, in general, are mountainous, rugged, and picturesque. Sandy shores and melancholy moorland, broken by numerous lochs and pools, scanty pastures, and rocky hillsides, are the prevailing features. The inhabitants, who use the Gaelic language, mostly combine their labours on land with fishing, and in the outer islands with fowling. Sheep-rearing and distilling (especially in Islay) are other chief occupations; slate-quarrying is an important industry between Mull and Jura. Kelp-burning has now practically ceased. Coarse tweeds are a characteristic production, especially of Harris. The Hebrides are the Ebudæ of Ptolemy and Pliny, the Sudreys (the Southern Isles) of the Norsemen, who colonized them in the 9th century. In 1266 the islands were transferred to Scotland, and were for a time held by native chiefs of the hereditary race of Somerled of Argyll; but in 1346 the Macdonald of Islay made himself overlord, with the title of 'Lord of the Isles,' till the reign of James V. Callernish in Lewis has a group of megaliths akin to those of Stonehenge. (See Anderson's *Scotland in Pagan Times*.) Sir Walter Scott and William Black have done much to make the islands familiar to English readers. See Mackenzie's *History of the Macdonalds and Lords of the Isles*; Dr. Johnson's *Journey to the Western Islands*; J. and E. Pennell's *Our Journey to the Hebrides*; and Pennant's *Tour in Scotland and Voyage to the Hebrides*.

Hebrides, NEW. See **NEW HEBRIDES**.

Hebron (Gen. 23:2-19, etc.), ancient city of Judah, Palestine, 20 m. S. of Jerusalem. The modern town of 10,000 inhabitants surrounds the Jewish enclosure over the rock-cut cavern supposed to be the sepulchre of Abraham, Isaac, Jacob, Sarah, Rebekah, and Leah, representing the cave of Machpelah (Gen. 23:19, etc.), which lay E. of Mamre or Hebron (Gen. 13:18).

Hecataeus of Miletus (c. 550-476 B.C.), ancient Greek historian and geographer. His chief works were *The Circuit of the Earth* and *Genealogies* or *Investigations* (historical). The extant fragments are printed in Müller's *Fragmenta Historicorum Graecorum*, i. (1841).

Hecate, a Greek divinity, generally represented as a daughter of Persæus or Perses, was the only one of the Titans to retain her power under Zeus. She was identified with Selene (the moon) in heaven, Artemis on earth, and Persephone in the nether world, and hence is represented with three bodies or three heads. As a goddess of the lower world, she

1842 to 1847 he made himself conspicuous as a revolutionary in the Baden Chamber of Deputies; and in 1848 he raised an armed band and invaded Baden, but was defeated, and took refuge at Basel, and there he founded a revolutionary paper, *L'Ami du Peuple*. The following year he went to America, and subsequently fought as a Federal in

ordained priest by Cardinal Wiseman (1849). In 1857 he visited Rome, and was authorized to found a new missionary order, the 'Paulists,' of which he was the first father superior. He founded (1865), and edited till his death, the *Catholic World*, the chief Roman Catholic organ in America. His publications include *Aspirations of Nature* (1857); *Catholicity in the United States* (1879). See Elliott's *Life of Father Hecker* (1891); and for an account of the controversy raised by Abbé Maignan, see Sedgwick's *Father Hecker* (1900).

Hecker, JUSTUS FRIEDRICH KARL (1795-1850), German physician and historian of medicine, born at Erfurt; became professor of medicine at Berlin. His chief publications are *Geschichte der Heilkunde* (1822-9); *Die Tanzwut, eine Volkskrankheit im Mittelalter* (1832; Eng. trans. 1846 and 1875); *Geschichte der neuern Heilkunde* (1839); *Kinderfahrten* (1845).

Heckmondwike, tn., 10 m. s.w. of Leeds, W. Riding, Yorkshire, England. It has manufactures of blankets, carpets, rugs, and chemicals, and there are coal mines. Pop. (1901) 9,459.

Hecle. See HECLA.

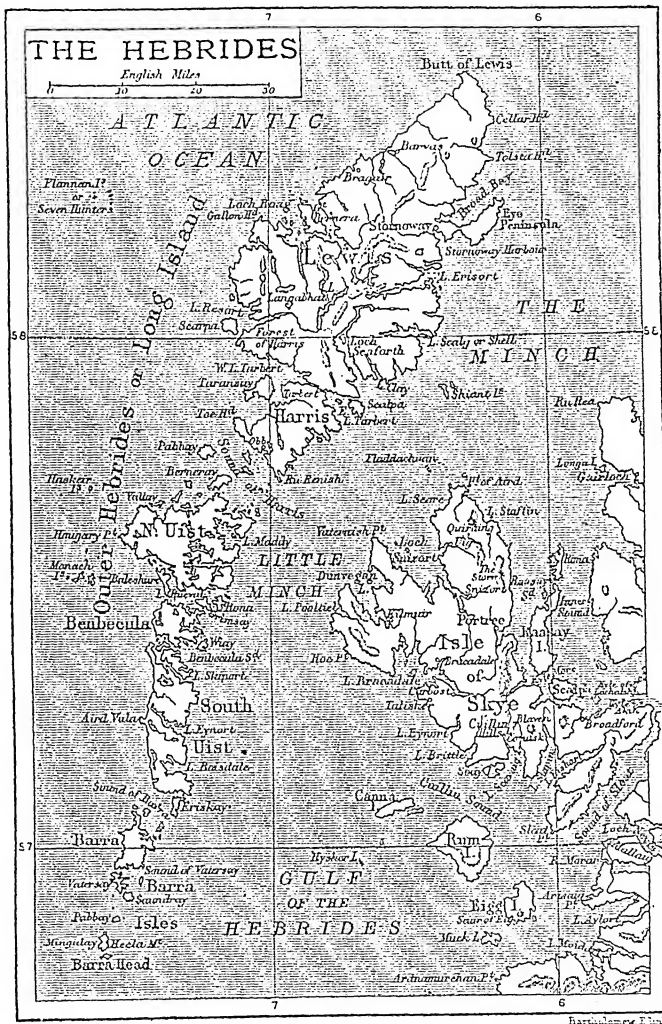
Hectare. See ARE.

Hector, champion of Troy in the Trojan war, was the eldest son of Priam and Hecuba, the husband of Andromache, and the father of Astyanax. His chief exploits are his single combat with Ajax, his pursuit of the Greeks to the ships, and his slaying of Patroclus. It was in revenge for this last exploit that Achilles sought him out and slew him, and then fastened his dead body to his chariot and dragged it to the Greek camp. The passages of the *Iliad* which describe the last meeting of Hector and Andromache, her lament upon his death, and the mourning of his mother, wife, and Helen at his funeral, are among the noblest and most pathetic pieces of poetry in all literature.

Hecuba, the wife of Priam, king of Troy, and the mother of Hector, Paris, and others. After the capture of Troy she was taken captive by the Greeks, and after the sacrifice of her daughter Polyxena succeeded in killing Polymestor, king of Thrace, who had murdered her son Polydorus. Finally she was changed into a dog, and leapt into the sea. Euripides has a tragedy named after her.

Hedge. See FENCES, BOUNDARIES.

Hedgehog. The common hedgehog of Europe (*Erinaceus europæus*) is widely distributed in the Old World. It is the largest of British insectivores, and, like



was the patroness of all kinds of sorcery and witchcraft. She was especially worshipped at cross-roads; dogs, honey, and black lambs were offered to her.

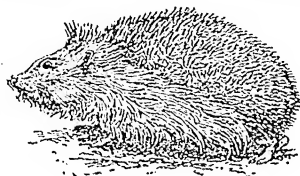
Hecatomb. See SACRIFICE.

Hecker, FRIEDRICH KARL FRANZ (1811-81), German revolutionist, was born at Eichersheim in Baden, and in 1838 became an advocate at Mannheim. From

the civil war (1860-4). He died at St. Louis.

Hecker, ISAAC THOMAS (1819-88), American Roman Catholic divine, born at New York; joined the Brook Farm community, and for a time shared Thoreau's hermit life. Received into the Catholic Church in 1845, he was engaged from 1847-51 in mission work in England, being

the other species of the genus, has the back and sides densely covered with short spines. The neck is short, the black snout shaped like that of the pig, the limbs and tail short. Like other



Hedgehog.

hedgehogs, the common form possesses the power of rolling itself up into a ball on an alarm, so that nothing but the spines are exposed to the enemy. The diet is very varied, comprising both vegetable and animal matter. Nocturnal in its habits, the hedgehog is most frequently seen at dusk. In winter it hibernates within its burrow, which is often placed at the foot of hedges. Numerous other species of hedgehog occur in Asia and Africa.

Hedgehog Plant is a name sometimes given to plants belonging to the genus of leafless, succulent plants known as *Echinocactus*. The plant is covered with spines or prickles like a hedgehog.

Hedgeley Moor, township, Northumberland, England, 10 m. W.N.W. of Alnwick, was the scene of the victory of the Yorkists under Lord Montague over the Lancastrians under Margaret of Anjou, April 1463. Sir Ralph Percy was killed in the fight.

Hedge-mustard (*Sisimbrium officinale*), a common British roadside plant, with small, yellow, cruciferous flowers borne on upright branches, from twelve to eighteen inches in length. It has hairy seed-pods and leaves.

Hedin, SVEN ANDERS VON (1865), Swedish Asiatic explorer, born at Stockholm; was a pupil of Von Richthofen. Whilst still a student he travelled (1885-6) in Persia and Mesopotamia, and later (1890-1) through the Central Asian khanates to Kashgar. But his real work as an explorer began in 1893, when he crossed the Pamirs in the depth of winter. In the following summer he examined the glaciers of the Mustagh-ata, and attempted to reach its summit, climbing to 20,660 ft. In 1895 he crossed the desert of Takla-Makan, and nearly lost his life, and explored the mountain chains around the sources of the Yarkand Daria. Then, after discovering in the sands of the Takla-Makan the ruins of an ancient city (Borasan), and traces of Buddhist civilization, he travelled down the Keriya Daria

to the region of Lob-nor, which he explored. Finally he traversed (1896) the north of Tibet and Mongolia, finishing his journey at Peking. In 1899 he floated down the Tarim, and solved the problem of the Lob-nor. On its ancient northern shore he dug out of the sand evidences of Chinese civilization (houses, wood-carvings, MSS., etc.) of the 3rd century A.D. The next two years he spent in Tibet, crossing it from north to south and from east to west, and twice attempted to enter Lhasa disguised as a Mongol. In October 1903 he again set out on a long journey of exploration through Persia and in Tibet. Dr. Sven Hedin is not only an intrepid and enterprising traveller, but also an experienced linguist and a patient and skilled scientific observer. He has published *Through Asia* (2 vols. 1898), *Central Asia and Tibet* (1903), and *Adventures in Tibet* (1904). The scientific results of these journeys were published in *Petermann's Mitteilungen, Ergänzungsheft 131* (1900), and *The Scientific Results of a Journey in Central Asia, 1893-1902* (6 vols. 1904, et seq.).



Sven Anders von Hedin.
(Photo by Elliott & Fry.)

Hedjaz. See HEJAZ.

Hedonism, the ethical theory according to which pleasure is held to be the chief good. A distinction has been made between *ethical* and *psychological* hedonism (see Sidgwick's *Methods of Ethics*, bk. i. ch. iv. sec. 1, 1901). In Greek ethics hedonism was represented by the Cyrenaic and Epicurean schools. Thus, in the view of Aristippus, the head of the Cyrenaics, the pleasure of the moment, and, best of all, intense bodily pleasure, was the true object of pursuit; whereas Epicurus advocated the stable and serene happiness to be derived from a life of simplicity

and self-restraint. But in both cases it is the happiness of the individual—the elements of which it is composed and the means of securing it—that the Greek thinkers have in view; although, of course, they are aware, and Epicurus in his doctrine of friendship strongly insists, that happiness is not to be had without a measure of regard for others. In the most important modern form of hedonism, on the other hand, the point of view is from the outset political or social. Utilitarianism aims at the greatest happiness of the greatest number, a collective rather than an individual good, although pleasure is still that in which the good consists. And this social and philanthropic aspect of the modern hedonism has given it a moral dignity, and even fervour, which are less easily associated with the individualistic form of the theory in ancient ethics. The classical exposition of the modern type of altruistic hedonism is to be found in Mill's *Utilitarianism*, although his argument is generally admitted not to be free from serious inconsistencies. A searching examination of hedonism, both as a method and as a theory, is given by Sidgwick in his *Methods of Ethics*, but he accepts and justifies the fundamental definition of the good in terms of pleasure (see bk. iii. ch. xiv.).

Heem, JAN DAVIDSZ VAN (c. 1603-83), Dutch painter, born at Utrecht, was the greatest master of flower and fruit painting that the Dutch produced. His draughtsmanship combines decision with all necessary softness, and his colouring sometimes approaches Rembrandt in depth and clearness.

Heemskerk (1498-1574), the name by which the Dutch painter, Maerten van Veen, is known, from the place of his birth, Heemskerk, near Alkmaar. He lived principally in Haarlem, where many of his pictures were destroyed when the Spaniards sacked that town in 1572; but a *Holy Family*, an *Ecce Homo*, and *St. Luke Painting the Virgin* still survive. Hampton Court has three of his pieces—*Jonah in the Whale's Belly*, *Jesus Healing the Sick*, and *Death and the Last Judgment*. He was influenced by Michael Angelo during a three years' stay in Rome (1532-5).

Heeren, ARNOLD HERMANN LUDWIG (1760-1842), German historian, born at Arbergen, near Bremen; held at Göttingen the chair of philosophy (1794), and subsequently of history (1801). He looked at antiquity from a new standpoint, paying special attention to the economic relations, political constitutions, and finances of the various states.

His chief works are *Historical Researches into the Politics, Inter-course, and Trade of the Principal Nations of Antiquity* (1793-96; 4th ed. 1824-6; Eng. trans. 1833); *A Manual of Ancient History* (1799; 5th ed. 1828; Eng. trans. 1840); *A Manual of the History of the Political System of Europe and its Colonies* (1800; 5th ed. 1830; Eng. trans. 1834). Heeren's *Historischen Werke* appeared in 15 vols. (1821-6).

Hefele, KARL JOSEPH VON (1809-93), German ecclesiastical historian, born at Unterkochen in Württemberg; became professor of theology at Tübingen (1840), and in 1869 bishop of Rottenburg. His great work is *Konziliengeschichte* (1865-71; Eng. trans. 5 vols. 1871-96); also *Der Kardinal Ximenes und die kirchlichen Zustände Spaniens im 15. Jahrhundert* (1844; Eng. trans. by Canon Dalton, 1860), and two works bearing on the question of papal infallibility—*Honorius und das sechste allgemeine Konzil* and *Causa Honorii Papae* (both 1870). With Dupanloup and Darboy, he opposed the dogma of infallibility at the Vatican Council, but in 1871 submitted to the papal authority.

Hegel, GEORG WILHELM FRIEDRICH (1770-1831, the greatest German philosopher of the post-Kantian period, was born at Stuttgart. After spending six years as tutor in private families, he went in 1801 to Jena, where his friend Schelling, with whose philosophy he was in close sympathy, was professor. Here he qualified as lecturer, and in 1805 was appointed professor; but in the following year everything was thrown into confusion by the war of Prussia with Napoleon and the battle of Jena. In 1808 he got the post of rector of the Nuremberg High School. While at Nuremberg he produced his second important philosophical work, the *Science of Logic*—the first, the *Phenomenology of Spirit*, having already appeared in 1807. In 1816 he was called to a chair in Heidelberg University, and thence in 1818 to Berlin. He now became the recognized leader of philosophical thought in Germany. His *Encyclopædia of the Philosophical Sciences*, produced while he was at Heidelberg, and expanded in two later editions, and his *Philosophy of Right* (1821), complete the list of important works published during his lifetime; but after his death his lectures on *Aesthetics*, *Philosophy of Religion*, *Philosophy of History*, and *History of Philosophy* were published by his pupils.

The system of Hegel is the culmination of the idealistic movement to which the philosophy of Kant gave rise. In Hegel

the Kantian dualisms of phenomena and noumena, of rational form and given matter, of speculative reason and practical reason, disappear. (See KANT.) Reason is no longer a mere faculty, but the essential nature of reality: 'the rational is the real, and the real is the rational.' Reality is in experience as its rational meaning and structure, and it is the business of philosophy to set forth this rationality or truth of experience in a comprehensive and systematic way. Hegel was not content to enunciate this idealistic principle in any abstract or general fashion, but sought to exhibit its meaning with the most thorough fullness of analysis and application.

His system has three main divisions—(1) the logic, in which the conceptions that underlie experience in its various forms, and so express its rational structure in the abstract, are systematically analyzed and developed by his 'dialectical' method; (2) the philosophy of nature; and (3) the philosophy of spirit or mind, in which the rational structure of the world of nature on the one hand, and of the world of man's individual, social, and spiritual life on the other, is set forth in the concrete. The philosophy of nature is the weakest part of the system, on account of the limitations—both subjective and objective—of Hegel's knowledge. Of the *Logic*, it has been said (by Edward Caird) that it is 'the one work which the modern world has to put beside the *Metaphysics* of Aristotle.' He deals with the great interests of human life, with the organization of society and the state, with law and morality, with art and religion. Of one feature, indeed, of his treatment of these themes—his conception of an immanent logic in the historical development of human institutions—it may be said that it deepened and vitalized historical study in all its departments.

After the death of Hegel divergent tendencies began to show themselves in his school, especially as regards religious issues, and speedily resulted in a sharp division between a right and a left wing. The left, or positivist group, which was the more vigorous and original, had Strauss and Feuerbach for its leaders.

A considerable portion of Hegel's system is accessible in translations: the *Logic* (2nd ed. 1892-94) and *Philosophy of Mind* (1894), from the *Encyclopædia* (by Wallace); the *Philosophy of Right* (Dyde, 1896); part of the *Philosophy of Fine Art* (Bosanquet, 1886); *Philosophy of History* (Sibree, 1857); *Philosophy of Religion* (Speirs and Sanderson, 1895); *History of Philosophy*

(Haldane, 1892-6). For his life, see Caird's 'Hegel' (1883), in *Phil. Classics*; for his place in the history of philosophical thought, Wallace's *Prolegomena to Hegel's Logic*; and for criticism, Seth's *Hegelianism and Personality* (1887). See D. G. Ritchie's *Darwin and Hegel* (1893), and R. Macintosh's *Hegel and Hegelianism* (1903).

Hegesippus, an Athenian statesman and orator, who flourished about 350 B.C., being an opponent of Philip of Macedon. The oration on the *Halonnescus*, included in the works of Demosthenes, is now generally attributed to him.

Hegesippus (?120-180), the 'father of church history,' wrote at Rome, about the middle of the 2nd century, the *Five Memorials of Ecclesiastical Affairs*, which has perished, except for a few fragments bearing chiefly on the rise of heresies, the episcopal succession, and the preservation of the orthodox doctrine at Rome and Corinth, preserved by Eusebius and Photius. The Tübingen school regard him as belonging to the Judaizing section of the church, but this is greatly contested. See the fragments in Routh's *Reliquiae Sacrae* (1847) and Grabe's *Spicilegium*, ii., and in vol. viii. of *The Ante-Nicene Fathers*.

Hegira. See HEJIRA.

Heiberg, JOHAN LUDVIG (1791-1860), Danish dramatist and critic, a student of Calderon (by whom he was largely influenced), and the inventor of the romantic-comic Danish vaudeville, was born at Copenhagen. His vaudevilles (1823-39), including *Nei* (1836) and *Ja* (1839), rescued the stage from the extravagances of the romanticists, and were a return to Holberg's manner. Yet in his dramas, *Elverhøi* (1840) and *Alferne* (1835), he is himself a true romanticist in the best sense. His Aristophanic comedy, *En Sjael efter Døden*, is a fine satire of the follies of the day. As one of the directors and ultimately censor of the National Theatre (1849-56), and as editor of the famous *Flyvende Post* (1827-30), he exercised a salutary influence. He was also a great critic. See *Collected Works*, in 22 vols. (1861-2); Hansen's *Om J. L. Heiberg* (1867).

Heiberg, PETER ANDREAS (1758-1841), Danish author, born at Vordingborg. Being banished for his violent attacks on the government (1799), he went to Paris, where Napoleon gave him an appointment in the foreign office. He accompanied Talleyrand to Berlin, Warsaw, Erfurt, and Vienna. He was a witty but mordant satirist, and wrote songs, comedies, and pamphlets. The

comedies include *Poverty and Wealth* (Eng. trans. 1799) and *Independence* (Eng. trans. 1838, by C. Churchill). Heiberg married Fru Gyllembourg-Ehrensward in 1790. See collected dramas (ed. Rahbek, 1806-19); Heiberg's *P. A. Heiberg og Thomasine Gyllembourg* (1882); Schwann-flügel's *P. A. Heiberg* (1891).

H. E. I. C. S., Honourable East India Company's Service.

Heide, tn., Prussian prov. of Schleswig-Holstein, 21 m. by rail s. of Husum. It is the birthplace of the Platt-Deutsch poet, Klaus Groth (1819). Pop. (1900) 8,112.

Heidegger, KARL WILHELM, BARON DE HEIDECK (1788-1831), German general and artist, was born at Saaralben in Lorraine. He distinguished himself in the campaigns against Austria, Prussia, and Tyrol. On his retirement from the army he settled at Munich, where he acquired the reputation of a skilful painter by his series of frescoes in the Glyptothek, especially *The Horses of the Sun*, after Cornelius. A number of his pictures are in the Berlin and Munich National Galleries.

Heidelberg. (1.) Town, Germany, in N. of grand-duchy of Baden; beautifully situated between the l. bk. of the Neckar and the Königsstuhl (1,865 ft.) and other hills, 11 m. by rail s.e. of Mannheim. The glories of Heidelberg are its university and its castle. The university (founded in 1386) was attended in 1904-5 by 1,655 students. Among the distinguished men who have taught here may be mentioned Reuchlin, Pufendorf, Gervinus, Kuno Fischer, Helmholtz, and Bunsen. The castle, 330 ft. above the Neckar, forms a rude square, with circular towers at the corners, the whole thickly overgrown with ivy. The building itself is a ruin, destroyed by the French in 1689 and 1693, and by lightning in 1764. The oldest part of the edifice dates from 1400-10; other large wings were reared in 1556-59, 1601-7, and 1618. Within its walls are preserved the municipal art and antiquarian collections, and a gigantic wine-cask of a capacity of 46,732 gallons. In the town below, which consists chiefly of one main street nearly two miles long, are the late Gothic church of the Holy Ghost, contemporary with the oldest part of the castle, and containing the tomb of its founder, the Emperor Rupert, and his consort; the Gothic church of St. Peter; the Jesuit church; and the monument to General von Wrede (1767-1838), a native of the town. There is an active trade in books, wine, tobacco, and hops; beer, leather, tobacco, and mathematical instruments are the chief

industrial products. From the end of the 12th century down to 1721 Heidelberg was the capital of the Rhenish palatinate. Pop. (1900) 40,121. (2.) Division and tn. of the Transvaal colony, British S. Africa, in the centre of the Witwatersrand, about 50 m. s. of Pretoria. The town is considered the best sanatorium of the Transvaal.

Heidenheim, tn., Württemberg, Germany, 31 m. N. by E. of Ulm by rail, with cotton and woollen industries, dyeworks, breweries, etc. Pop. (1900) 10,510.

Heidenstam, WERNER VON (1859), Swedish author, born at Olshammer in Örebro; one of the most brilliant masters of style in modern Sweden, and the reviver of the historical romance in that country. Beginning as a realist, in his latest works he has struck out an original path of his own. His principal work is *Karolinerne* (1897; part Eng. trans. as *A King and his Campaigners*, 1902); besides which he has also written the novels *Endymion* (1889) and *Hans Alienus* (1892); poems in *Dikter* (1895) and *Vallfart och Vandringsår* (1898), *Den Hellige Birgittas Pilgrimsfärd* (1901), and *Skt. Göran och Draken* (1900).

Height. See ALTITUDE.

Heijn, or HEYN, PIET (1570-1629), Dutch admiral, born at Delftshaven. Captured and sent to the galleys by the Spaniards, he conceived a mortal hatred of them. Becoming in 1623 vice-admiral in the W. India Company's service, he made two expeditions to Brazil, and succeeded in capturing the 'Silver Fleet' (1628), with its immense treasures. He perished fighting against Dunkirk privateers.

Heilbron, div. and tn. of the Orange River Colony, British S. Africa, lying along the s. bk. of the Vaal R.

Heilbronn, tn., Württemberg, Germany, 33 m. by rail N. of Stuttgart, and on the Neckar. The town has several old buildings—e.g. the Deutsches Haus, Götzens Turm, Schöenthaler Hof, the town hall (1540), the church of St. Kilian (1013-1529). Robert Mayer the physicist was born here in 1814. The town has reminiscences of the Emperor Charles v., Götz von Berlichingen, Franz von Sickingen, Georg von Frundsberg, Schiller, and the legendary Kätchen von Heilbronn. It manufactures silversmiths' ware, iron and steel goods, paper, sugar, salt, chicory, and chemicals. Wine, fruit, and beer are produced, and sandstone quarried. The ancient mineral spring, from which the town derives its name, ceased to flow in 1857. Heilbronn took an active part in the reformation. Here, in 1633, after the

death of Gustavus Adolphus, a conference determined upon the continuance of the 'Thirty Years' war. Pop. (1900) 37,891.

Heil Dir im Siegerkranz, the Prussian national hymn. The words were written by a Holstein pastor, Heinrich Harries (1762-1802), for the birthday of Charles VII. of Denmark (1790), to the melody of the English 'God save great George, the King.'

Heiligenstadt, tn., Prussian prov. of Saxony, 33 m. by rail E. of Kassel. Pop. (1900) 7,249.

Heilsberg, tn., prov. of E. Prussia, Prussia, 40 m. s. of Königsberg, on the Alle. Here, on June 10, 1807, the Russians and Prussians under Bennigsen gained a slight victory over the French under Soult. Pop. (1900) 5,514.

Heilsbrunn, tn., Bavarian prov. of Middle Franconia, 17 m. by rail s.w. of Nuremberg; has portions of a once celebrated Cistercian monastery, founded in 1132 and disbanded in 1555, in which were buried several princes of the Franconian branch of the Hohenzollern family, including the first three Electors of Brandenburg. From 1581 to 1736 the town possessed a famous school. Pop. about 1,300.

Heimskringla. See ICELAND.

Heine, HEINRICH (HARRY) (1797-1856), German poet, was born at Düsseldorf, of Jewish parents. Harry shared his father's French sympathies and worship of Napoleon, to which he gave eloquent expression in the ballad *Die Beiden Grenadiere*. His uncle, Salomon Heine, a wealthy merchant in Hamburg, set him up in business there, but soon became convinced that Harry was unfit for commercial life. In 1819 he went to the University of Bonn, where he devoted himself mainly to German literature and antiquities, and derived much help from A. W. von Schlegel. Then after a few months in Göttingen he went to Berlin, where he associated with Fouqué, Chamisso, and Schleiermacher. In 1822 he published a slender volume of *Gedichte*, reissued under the title *Junge Leiden* as the first part of the *Buch der Lieder* (1827). In 1823 appeared the *Lyrisches Intermezzo*. In the autumn of 1824 he wandered in the Harz Mts. (*Harzreise*), and in October visited Goethe, for whom he always expressed genuine admiration. As all government appointments in Germany were closed to Jews, Heine saw himself compelled to become a Christian (June 1825). His uncle now sent him to Norderny; the poetic result was his two splendid cycles of poems *Die Nordsee*, and a prose *Reisebilder*. In 1826 and 1827 he issued his lyrics and his prose writings in a collected form. The *Reise-*



Views in Heidelberg.

1. The Castle, from the Herrengasse. 2. View from the Castle. 3. The Brücken Thor. 4. The Bridge and the Castle.

bilder were greatly admired. The *Buch der Lieder* contains the majority of his finest lyrics, which have been set to music many times. With the exception of the seascapes of *Die Nordsee* and the poems taken from *Die Harzreise*, they are mainly inspired by his love for his cousin Amalie Heine and her sister Therese. The influence of popular poetry (the *Volkslied*), as collected in Arnim and Brentano's *Des Knaben Wunderhorn*, is unmistakable; and Heine himself confessed the debt he owed to Wilhelm Müller. In 1827 Heine obtained editorial work at Munich; but ill-health necessitated a change, and he went to Italy. Soon after his return his imagination was fired by the Paris July revolution; he determined to throw in his lot with the Liberals, and eventually settled in Paris in May 1831. There he began to regard it as his vocation to draw France and Germany together. It was with this object that he published his *Französische Zustände* in 1831 and 1832, and in 1834 (in French) an account of the great intellectual movements in Germany from Luther to Hegel. In 1836 appeared, in French and German, his account of the German *Romantische Schule*. His outspoken and sometimes bitter and cruel criticisms aroused enemies in both politics and literature, and in 1835 the sale of his works was prohibited in Germany by a decree which designated him as the leader of *Das Junge Deutschland*. His literary adversaries were attacked in what is perhaps his wittiest work, *Atta Troll* (1847). On the private life of his political opponent, Ludwig Börne, he made a shameful attack in a pamphlet issued after his death in 1837. In 1840-3 he published *Lutetia*, dealing with contemporary politics in France; and in 1844 *Neue Gedichte*, partly as beautiful as anything in the *Buch der Lieder*, partly strained and cynical. In 1843 he revisited Hamburg. His impressions of the political and literary conditions in Germany were given in the sprightly satire *Deutschland, ein Wintermärchen* (1844). The news of his uncle's death, and the money troubles to which this led, brought on a stroke of paralysis in January 1845, which left him a physical wreck; and from May 1848 to 1856 he was for the rest of his life chained to his 'mattress grave.' Intellectually still vigorous, he issued the *Romancero* in 1851, and in 1854 he was engaged on his *Letzte Gedichte und Gedanken* (1869) and *Memoiren* (1884). The last months of his life were cheered by the lady whom he called Monche, or his 'beautiful angel of death' (she assumed the name

Camille Selden, but her real name appears to have been Elise Krinitz). About no writer are such divergent views expressed as about Heine. He is perhaps least popular among his own countrymen, who point to his French sympathies as inconsistent with a true love of the Fatherland, to his religious vacillations as indicating a lack of moral vigour, to his cynicism as all the more dangerous for being often in such a splendid setting, to his indifference to artistic form and his careless use of the language as a fatal influence in German literature, counteracting (in the same way as with Jean Paul) the classical tendency to purity of diction and to harmonious composition. His admirers prefer to dwell on the beauty of many of his love lyrics, in which only Goethe has equalled him; on his skill in depicting nature—above all, the sea in its infinite moods; on his persistent attacks on German pedantry and Philistinism; and to palliate his failings, too obvious to be denied, they remind us of his constant struggle against ill-health and of the fundamental discords in his nature, which he himself has avowed in the words: 'I am a Jew, a Christian; I am tragedy, I am comedy—Heraclitus and Democritus in one; a Greek, a Hebrew; an adorer of despotism as incarnate in Napoleon, an admirer of communism as embodied in Proudhon; a Latin, a Teuton; a beast, a devil, a god.' Heine's complete works have been edited by E. Elster (7 vols. 1887-90) and by G. Karpeles (9 vols. 1893); the most correct text of the *Buch der Lieder* is Rippmann's (1900). For his life, see A. Strodttmann's *Heinrich Heines Leben und Werke* (3rd ed. 1884); W. Bölsche's *H. Heine, Versuch einer ästhetisch-kritischen Analyse seiner Werke* (1887); W. Sharp's short biography (1888). See also G. Brandes's *L. Börne und H. Heine* (1896), and *H. Heine* (1897). Numerous attempts to translate Heine's verse have been perpetrated; his prose works have been ably rendered by Leland (1892), and his *Works* by Brooksbank and Armour (12 vols. 1891-1905), Storr (*Reisebilder* and *Romantische Schule*, revised ed., 1900), and others.

Heineccius, JOHANN GOTTLIEB (1681-1741), German jurist, born at Eisenberg (Saxe-Altenburg), was professor of law at Halle, Franeker, and Frankfurt-on-the-Oder successively, and again at Halle from 1733 to his death; and elaborated a new method of teaching jurisprudence. His chief works are *Historia Juris Civilis Romani* (1733), *Elementa Juris Germanici* (1735), and *Elementa Juris Naturae et Gentium* (1737).

This last work, on international law, was translated into English in 1763.—His son, JOHANN CHRISTIAN GOTTLIEB HEINECCIUS (1718-91), edited his *Opera Omnia*, with Life prefixed (9 vols. 1771), and published *Commentarius de Vita et Scriptis J. G. Heineccii*.

Heinicke, SAMUEL (1727-90), founder of the first school for the deaf in Germany. Born at Nautschütz, near Weissenfels, he served in the Seven Years' war; then betook himself to Hamburg, where he made the acquaintance of Klopstock, and applied himself to the education of the deaf and dumb. But in 1778 he removed to Leipzig, where he laboured till his death. Of his method little is known, save that he made the spoken language its fundamental principle. See his correspondence with De l'Épée, and his *Beobachtung über Stimme* (1778), and *Ueber die Denkart der Taubstummen* (1783); also Stötzner's *Samuel Heinicke* (1870).

Heinrich von Meissen, surname FRAUENLOB (c. 1260-1318), German meistersinger, settled at Mainz after 1311, and founded there the school of meistersingers. The most complete edition of his poems is by C. H. Müller (1843). See Börckel's *Frauenlob* (2nd ed. 1881).

Heinsius, DANIEL (1580-1655), Dutch scholar, whose real name was Heins or Heyns, was born at Ghent, and studied at Leyden under Joseph Scaliger, whom he succeeded as professor of politics and history in 1609, after having, fourteen years before, been appointed to a Greek chair. He edited valuable editions of Greek authors—Theocritus (1604), Bion (1604), Moschus (1604), Hesiod (1603), Aristotle (1611)—and of Horace (1610), Seneca (1611), Terence (1618), Livy (1620), etc.; and wrote good Latin poems, the best collected as *Poemata Auctiora* (1640), and poems in Dutch—*Nederduytsche Poemata* (1616). He edited the *Epistolae* of Scaliger in 1627.

Heir. An heir-apparent is he who will be a person's heir provided he survives that person. An heir-presumptive is one who will be a person's heir at his death, provided nothing occurs in the meanwhile to bar his claim. A living man has no heir (*nemo est heres viventis*), and the heir or heir-at-law is ascertained at death. He is generally the eldest male in the same degree of relationship to the ancestor, or, in default of males, the females in the same degree. But there may be a customary heir by a special custom of descent, by which the heir is the youngest son (see BOROUGH ENGLISH) or some other person. Formerly an estate in fee simple could only be created

by conveying to A and his heirs, and an estate tail by conveying to A and the heirs of his body. The term heir can only be used of succession to real and not to personal estate. (See INHERITANCE.)

Heirloom. Heirlooms, strictly speaking, are those personal chattels which pass on the death of the owner to the heir, and not to the executor or administrator. They are not devisable. Charters and other evidences of title are of the nature of heirlooms, as are escutcheons of arms set up in a church. But the term is generally applied to any chattels the enjoyment of which is intended to be permanently attached to an estate in land. Heirlooms cannot be sold under the Settled Land Acts except by order of the court. In Scotland, heirship movables which were similar to the strict heirlooms mentioned above were abolished by the Conveyancing (Scotland) Act, 1868.

Heister, LORENZ (1683-1758), German surgeon, born at Frankfurt-on-the-Main; was professor of surgery at Helmstedt from 1719-58. He published *Institutiones Chirurgice* (1719; Eng. trans. 1768) and *Anatomisch-Chirurgisches Lexikon* (1753), etc.

Hejaz, or HEDJAZ, Turkish vilayet, Arabia, lying along the N. half of the Red Sea coast, stretching eastward to the Nefud desert. It contains the sacred cities of Mecca and Medina, with the seaports of Jedda and Yembo.

Hejira, or HIRA. The era of the Hejira, used throughout the Mohammedan world, commemorates the flight (Ar. *Hijra*) of the prophet from Mecca to Medina, and was instituted by the Caliph Omar (634-644) in imitation of the Christian era. It is reckoned from Friday, July 16, A.D. 622. The years being purely lunar, are about eleven days shorter than those of the Christian era. To convert a date in the Hejira reckoning into the corresponding date in the Christian reckoning, multiply the former by '970224, and add 621'5774: the whole number will indicate the year, and the approximate day will be obtained by multiplying the decimal by 365. See Wüstenfeld's *Vergleichungstabeln der Mohammedanischen und Christlichen Zeitrechnung*, continued by Mahler (1854-87).

Hekla, or HECLA, volcanic mountain (5,108 ft.) of Iceland, in the S., 70 m. E. of Reykjavik. Since the 9th century it has been in frequent eruption, the latest being in 1878. The eruption of 1845-6 lasted, with intermissions, from September to April, and the lava ashes ejected were borne to the Orkney Is. at a speed of twenty-four miles an hour.

Hel, in the mythology of the ancient Germanic and Scandinavian races, the goddess of the lower world and of death. She was the daughter of Loki, the personification of malice, and was hurled by the All-father into the depths of Nifheim, where she ruled over those human beings who died of disease or old age. In the middle ages she became confounded with the kingdom she ruled over, and eventually the double conception was held to be synonymous with hell, the place of punishment.

Helder, a fort, seapt. and tn. of the Netherlands, at the N. extremity of prov. of N. Holland, at the entrance to the Zuider Zee. It is protected against the sea by embankments of enormous strength. At Willensoord, close by, are the stores of the Dutch navy and a naval cadet school. Helder was first fortified by Napoleon in 1811, and since 1826 has been immensely strengthened by the Dutch. Just outside the harbour the English fleet was defeated by De Ruyter and Tromp in 1673. Pop. (1899) 25,159.

Helderberg Formation. This belongs to the Upper Silurian system of N. America, covers considerable areas in New York, the Catskills, and the Appalachians, Maine, and Nova Scotia, and includes a thick limestone with Pentamerus, and sandstones and shales, often full of characteristic fossils. The total thickness is 600 ft. in New Jersey and 300 ft. in New York. The formation must have been laid down in clear shallow seas at some distance from land. Many fossils have been described from the Helderberg, among the commonest being Orthoceras, Pentamerus, Spirifer, Phacops, Bronteus, and Acedaspis.

Helenä, heroine of the Trojan war, was the daughter of Tyn-dareus and Leda, and sister of Pollux, Castor, and Clytemnestra; later accounts make Zeus her father, and say that she was produced from the egg of a swan. Her surpassing beauty caused suitors from all Greece to ask for her hand; but after Menelaus was chosen Paris bore her off to Troy, and hence arose the Trojan war. After the capture of Troy she returned to Sparta with Menelaus. See Andrew Lang's *Helen of Troy* (1882).

Helena. (1.) City, Arkansas, U.S.A., co. seat of Phillips co., on the Mississippi, 50 m. S.W. of Memphis. It ships cotton and cottonseed oil. Pop. (1900) 5,550. (2.) City, Montana, U.S.A., co. seat of Lewis and Clarke co., and cap. of the state, stands at 4,108 ft., 45 m. E.N.E. of Butte, in a rich gold and silver mining region. It is the seat of Montana Wes-

leyan University (1890). Pop. (1900) 10,770.

Helena, FLAVIA JULIA (c. 247-c. 327), the wife of Constantius Chlorus, and mother of Constantine the Great. She is famous for her attachment to Christianity, her alleged discovery at Jerusalem of the sepulchre of our Lord and the wood of the true cross.

Helensburgh, watering and residential place for Glasgow, in par. of Row, Dumbartonshire, Scotland, on the r. bk. of the Clyde, opposite Greenock, and at the entrance to the Gareloch. Henry Bell, the inventor of the *Comet* steamboat, died here in 1830. Market-gardening and fishing are carried on. Pop. (1901) 8,554.

Helenus, son of Priam and Hecuba, famous for his prophetic powers; fought in the Trojan war. Later stories tell that Pyrrhus took him to Epirus; and after Pyrrhus's death he married Andromache, and reigned there.

Heligoland. See HELIGOLAND. **Helade = Radulescu, JOAN** (1805-72), Roumanian author and statesman, born at Tirgoviste in Walachia; was one of the leaders of the 1848 revolution, but lived in exile from 1849-54. He founded the first journal published in the Roumanian language, *Curierul Romanes* (1828-48), and did much to foster the formation of a national literature, by didactic works, translations, and original poetry.

Heliand, THE, an old Saxon poem, written in the early part of the 9th century, the subject being the Saviour. The author is unknown. The verses are alliterative. It has been edited by Heyne (1883) and Rieckert (1876), and translated into modern German by Simrock (1882).

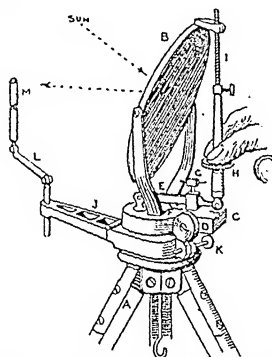
Helicidæ, the family to which the snail belongs, and which also includes a large number of terrestrial forms of similar character.

Helicon, a mountain in Bœotia, Greece, between Lake Copais and the Gulf of Corinth; height, 5,735 ft. It was reputed in Greek legend to be the haunt of the Muses, whose fountains, Aganippe and Hippocrene, were on it.

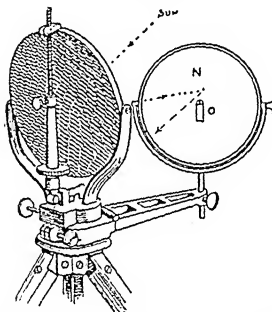
Heligoland, or HELGOLAND (Ger.), isl. of the North Sea, 28 m. N.W. of the mouth of the Elbe, anciently a religious centre of the Frisian race (whence its name of 'holy island'); for eighty-three years in the possession of Britain, but ceded to Germany in 1890. It consists of a steep, rocky plateau (184 ft.), with a strip of firm sand at its S.E. foot. It is visited in summer for sea-bathing, and possesses the North Sea museum and a biological institute. Since 1890 it has been strongly fortified. Area, 130 ac.; pop. (1900) 2,307.

Heliodorus, writer of Greek romance, was a Syrian, who lived about the end of the 4th century, and was in later life bishop of Tricca in Thessaly. His romance, the *Æthiopica*, has been edited by Bekker (Teubner Series, 1855); Eng. trans. in Bohn's series; and in 1887 (new ed. 1895).

Helioabalus. See ELAGABALUS.



Heliograph: sending Message by Direct Reflection.



Heliograph: Message by Double Reflection.

A, Tripod with cap; B, signalling mirror; C, tangent box; D, tangent screw; E, lever arm; F, spring; G, capstan-headed screw for regulating beat; H, key; I, screw in socket; J, jointed arm; K, clamping screw for arm; L, double-jointed sighting rod; M, sighting vane; N, duplex mirror; O, paper sighting vane.

Heliograph, an instrument used for signalling by flashing the sun's rays from the face of a mirror. If the mirror is vertically below the sun, or between it and the receiving station, a second mirror must be used to direct the sun's rays on to the face of the first. If the mirror is directed exactly at the required spot, its flashes cannot be read more than ten yards on each side of the latter when the distance is a mile, or fifty yards if two miles. The mirrors, sighting-vane, and other mechanism for adjustment are mounted on a tripod. The range of the heliograph depends on the size of the mirror; seventy miles

was attained in the Waziri expedition of 1881, with a mirror of five inches diameter.

Heliometer, an instrument originally devised (as the name implies) for measuring the sun's diameter, but now chiefly applied to micrometrical work on the stars. Fraunhofer gave it, in 1814, its modern form by dividing the object-glass of a telescope into two movable segments, the amount of separation imparted to which serves for the precise measurement of sky intervals. A heliometer $8\frac{1}{2}$ in. in aperture, lately erected at the Kuffner Observatory, Vienna, is the largest yet constructed; but the most important results have been obtained with the similar though somewhat smaller instruments at the Cape and Yale College observatories.

Heliopolis ('city of the sun'). (1.) Greek name for BAALBEK. (2.) City in Lower Egypt, on the E. branch of the Nile, just N. of the angle of the Delta; was one of the chief seats of the Egyptian sun-worship. It is called On in the Bible.

Helios, the god of the sun in Greek mythology, was the son of Hyperion and Thea, and is himself often called Hyperion. Greek poetry describes him as starting from a splendid palace in the east, and traversing the sky in a chariot with four horses, to arrive at another palace in the west. The island Thrinacia, with its flocks and herds, was sacred to him. His worship was common throughout Greece, particularly in Rhodes, where the famous Colossus was a representation of him. In later times he was identified with Apollo.

Heliroscope, a form of telescope for viewing the sun without injury to the eyes, either by using smoked or obscured glass, or by means of mirrors of transparent glass which reflect only a small proportion of the light.

Heliotrope, or TURNSOLE, a genus of plants belonging to the order Boraginaceæ. The most valuable species is *H. Peruvianum*, the well-known cherry-pie. The plant is easy of cultivation, but cannot bear cold.

Heliotropism is the response of a plant to the stimulus of light. Familiar examples may be seen in window-plants. The stems assume a curve in the direction of the light, and are said to be positively heliotropic, as are the leaf stalks; the leaf blades take up a vertical position facing the light, and are transversely heliotropic. Aerial roots, the stems of some tendril-climbers, and the haptera or holdfasts, as in *Ampelopsis Veitchii*, are negatively heliotropic, and turn away from the light.

Heliozoa, or sun-animalcules, are Protozoa characterized by the stiff processes which radiate out from the spherical body. Most occur in fresh water. The protoplasm of the body is much vacuolated, and there is one or maybe several nuclei. Shell structures are sometimes present and sometimes absent. An example is *Actinophrys sol*, the sun-animalcule proper.

Helium (He, 4), a gaseous element isolated in 1895 by Sir William Ramsay from a mineral called cleveite. The existence of such an element in the sun's atmosphere had previously been discovered by Lockyer (1868) spectroscopically, and it has since been shown to be present in our own atmosphere and in many natural waters and minerals. Helium is best prepared by heating a mineral containing it, either alone or with potassium bisulphate, in a vacuum, and purifying the gas set free by passing it over heated magnesium or sparking it with oxygen. Helium is the next lightest gas to hydrogen, is colourless, very insoluble in water, and the most difficult of all gases to liquefy. It is believed to consist of one-atom molecules; and although it may be present in the minerals containing it in some form of combination, all attempts to make it combine with other elements have hitherto proved fruitless. It has been recently demonstrated that radium slowly breaks up into helium, and it may be by some such action that it is formed in the minerals containing it. It is distinguished from similar gaseous elements by its density, and by the characteristic spectrum, containing a distinctive yellow line, given when an electric discharge is passed through the rarefied gas.

Helix, a genus of gasteropods to which belong many common snails—e.g. the garden snail, *H. aspersa*.

Hell, a term used both in theological and popular speech to denote the final abode of the lost. The grim implications of its modern usage are traceable through Christian theology to Jewish and even heathen notions regarding the ultimate doom of the wicked. As used in our English Bible (*A. V.*) its interpretation demands the utmost caution, as it represents four different Hebrew or Greek words, Sheol (Hades), Tartaros, and Gehenna. (1.) The Hebrew *Sheol*, which appears in the Septuagint and the New Testament as *Hades*, seems to have been understood as a dim, shadowy region, where the dead in some fashion continued to exist, but where they could hardly be said to live; further, it was the destination of good and bad alike, and was not

thought of as a place of punishment (cf. Job 3:13-19). Sheol is thus almost identical with the Greek Hades. In the apocryphal and apocalyptic books, however, Hades begins to appear as a place where moral qualities have their appropriate recompense—reward for the good, penalty for the wicked; and the distinction is found clearly expressed in the New Testament—e.g. in the parable of the rich man and Lazarus, in which, however, the name Hades is reserved for the place of torment, the other being designated Abraham's bosom. Sheol (Septuagint, Hades) is sometimes translated 'grave' or 'pit' in the Authorized Version, but in the New Testament Hades is always translated 'hell.' The Revised Version usually leaves Sheol untranslated in the poetical books, and likewise Hades in the New Testament; the American Revised Version throughout simply transfers the original words. (2.) The Greek *Tartaros*, which appears in the New Testament only as a verbal form (2 Pet. 2:4), was the name of the locality beneath Hades, in which, according to the Homeric poems, the Titans and other insurgent supernatural beings were confined. The writer of 2 Peter seems to have known the accurate use of the word, since he applies it to the abode of the fallen angels. The whole conception, however, is somewhat out of touch with New Testament ideas, and has more in common with the teaching of Jewish apocalyptic books, such as the Apocalypse of Baruch (56:10f.) and Enoch (10:6f.). (3.) *Gehenna*, in the Apocrypha and New Testament, comes nearest to the modern notions of hell as a place of woe. But the New Testament, in speaking of it, maintains a wise and solemn reserve, in striking contrast not only to the fantastic utterances of the non-canonical books, but to the savage imagery of mediæval theology (cf. Dante's *Inferno*) and the speculations of many modern writers. When we have said that the New Testament authors, with all their remarkable appreciation of moral values and issues, do not utilize the doom of the reprobate as a religious motive, and that they nevertheless speak of it as involving the sternest imaginable suffering and loss, and—according to a fair exegesis—as permanent, we have nearly exhausted all that can lay claim to certainty on scriptural authority. In the main, this may be said to be the orthodox position of all the great branches of the church. The Roman Catholic and Greek Churches, indeed, following certain Jewish, but especially pagan, beliefs (see Virgil, *Æneid*, vi. 723ff.), have instituted the doctrine of purgatory

as a place of purification for such believers as die in sin; the repudiation of the doctrine forms an element in Protestant confessions generally. But of late years not a few leading theologians have expressed their belief in an intermediate state; while a more popular form of relief from the doctrine of eternal torment has been sought in the theory of conditional immortality. The doctrine of apocatastasis, or universal restoration, has also had numerous eminent advocates from the days of Origen. See books on dogmatic or systematic theology generally—e.g. Dörner, Martensen, W. N. Clarke; on Biblical theology—e.g. Schultz, Boyschlag; commentaries on special passages; also Alger's *Crit. Hist. of the Doctrine of a Future Life* (1864); F. W. Farrar's *Eternal Hope* (new ed. 1892); Salmond's *Christian Doctrine of Immortality* (4th ed. 1901).

Hellas, the name given by the ancient Greeks to their country as a whole, including all lands inhabited by Hellenes, from Sicily or Marseilles in the w. to the Black Sea in the e. In Homer the terms Hellas and Hellenes are confined to a particular district of Thessaly and its inhabitants. It is difficult to understand how the name was extended to the whole Greek race. The name came into use during the 7th century B.C. It never denoted a political union.



Hellebore (H. fatidus).

1, Flowery branch; 2, flower; 3, stamen; 4, seed; 5, leaf.

Hellebore, a genus of plants belonging to the order Ranunculaceæ. There are two species supposed to be natives of Britain—the stinking hellebore or bear's foot (*H. fatidus*), which is evergreen, and the green hellebore (*H. viridis*), both bearing greenish flowers in early spring. But the genus includes also the Christmas and Lenten roses. These last are easy of culture, like a deep, fairly stiff, and rich though well-drained soil, and thrive best under trees, or on the north side of a hedge or wall.

Hellen, in Greek tradition the ancestor of the race, was the son of Deucalion and Pyrrha, or of Zeus and Dorippe. He was king of Phthia in Thessaly.

Hellenism, the name usually applied to that type of critical taste in literature and art which prefers to Hebraic intensity and Gothic exuberance the severity of artistic restraint and the chaste purity in design and execution characteristic of Greece during the Periclean epoch. Hellenism may be said to have taken rise at the time of the renaissance, when the monuments of classic genius were regarded as unapproachable models, which moderns might imitate, but could never hope to excel. Signs are not lacking that with the dawning 20th century the critical taste and the prevailing tone of the national genius, both in art and in literature, is again veering towards a classical revival, this time along purely Hellenic lines. The word has also a narrower signification when applied to such of the Jews as settled in Alexandria in the 2nd and 1st centuries B.C., and adopted the language, customs, and habits of thought of the polished and intellectual society of that city.

Heller, STEPHEN (1813-88), Hungarian pianist and composer, born at Pesth. At twelve he gave concerts in Vienna, and made a tour through Hungary, Poland, and Germany. In 1838 he settled in Paris, where he died. A follower, to some extent, of Schumann, the friend of Chopin, Berlioz, and Liszt, his works are marked by a charm and delicacy that place him almost on a level with Chopin as 'the poet of the piano.' He performed in London in 1849, and again in 1860 at the Crystal Palace with Charles Hallé. His works—*Nuits Blanches*, *Promenade d'un Solitaire*, *Dans les Bois*, etc.—are widely known in England. See *Life* by Barbedette (1876; Eng. trans. 1877).

Hellespont. See DARDANELLES.

Hell Gate, narrow rocky part of East R., New York, U.S.A., between Long Island and Manhattan Island. The former dangerous obstructions to navigation were removed in 1885.

Hellin, tn., prov. Albacete, Spain, 50 m. n.w. of Murcia. In the neighbourhood are the sulphur springs of Azaraque and the remains of a Roman fortress. Woollen goods are manufactured. Pop. (1900) 12,558.

Helmet, defensive armour for the head, chiefly of leather or metal, made in a very great variety of shapes, round-topped helmets being the most usual. A striking exception is the quite conical helmet worn by William

Helmet

the Conqueror, as figured in the Bayeux Tapestry. Crested helmets, in which the crest takes the form of a lion, eagle, or a griffin, date from the 13th to the 15th century. Assyrian helmets in bronze are known on bas-reliefs as far back as 1000 B.C. The casque, the cabasset, and the morion are amplified and some-

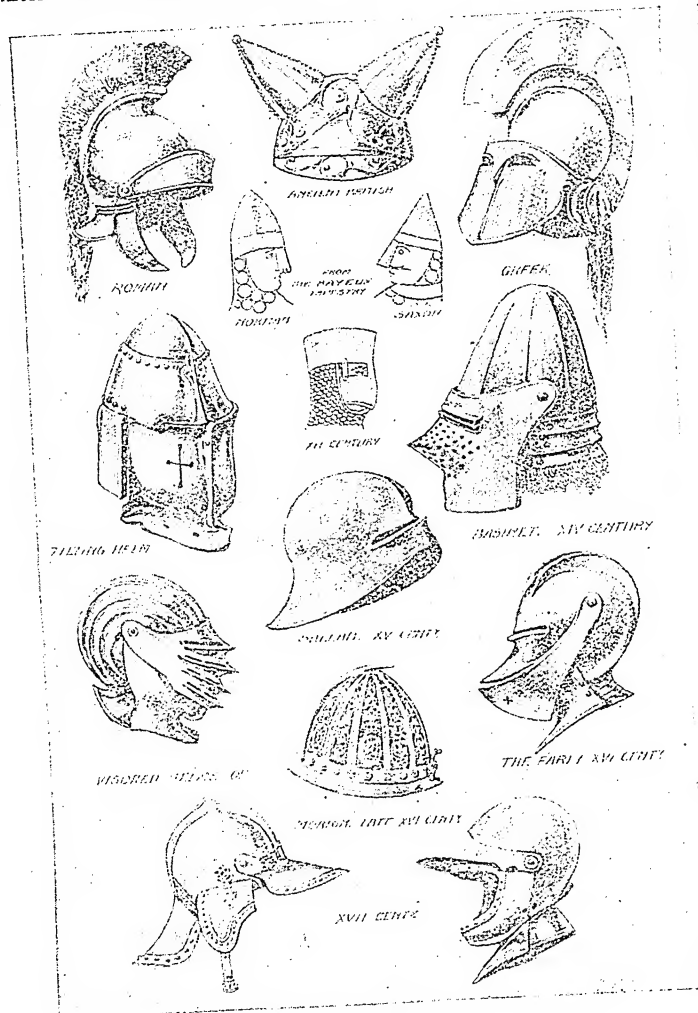
other light substance, take the place of the ordinary helmet. The name is also indiscriminately applied to the protective head-dress worn by firemen, divers, policemen, and others. **Helmet-shell** (*Cassia*), a genus of gasteropod molluscs in which the massive shell frequently consists of differently coloured

berg in 1849, at Bonn in 1855, and at Heidelberg in 1858. Although his earlier researches were mainly physiological, he took rank as a physicist and mathematician in 1847, when he published his striking tract on the conservation of energy. Naturally gifted with a powerful mathematical mind and a profound physical intuition, he gave a new direction to physiological research in seeing and hearing, his *Sensations of Tone* (1863-70) and his *Physiological Optics* (1867) being epoch-making works. Meanwhile he had created a new field in hydrodynamics by his famous investigations on vortex motion; and his inquiry into the connection between sensation and knowledge led him to the study of the foundations of geometry. He was called to Berlin in 1871, to fill the chair of physics. His contributions to the theory of electrodynamics, in which he aimed at greater generality than was given by Maxwell's theory, are of great importance; and it was at his instigation that Hertz demonstrated the existence of Maxwellian electro-magnetic waves. He enriched the theory of thermodynamics by his discussion of 'monocyclic' systems, and in his later papers endeavoured to get at the real essence of the principle of least action. Although the idea is tentatively put forth in Maxwell's writings, Helmholtz was the first to work out explicitly the notion of the electric atom or electron, as it is now called. See *McKendrick's Life in Masters of Medicine Series* (1899), and *Life in German*, by Königsberger (1903).

Helminthology, an old term sometimes used for the study of parasitic worms. See **PARASITES**, **NEMATODES**, and **TAPE-WORMS**.

Helmond, tn. of Netherlands, prov. N. Brabant, 28 m. by rail S.E. of s'Hertogenbosch (Bois le Duc). Pop. (1899) 11,436.

Helmont, JOHANN BAPTIST VAN (1577-1644), Belgian chemist, was born at Brussels. After teaching medicine at Louvain, he turned his attention to chemistry, settling at Vilvorde, near Brussels, in 1609, where for thirty years he practised medicine gratuitously. Although his philosophical conceptions were of a mystical and empirical nature, he added greatly to the development of chemistry by employing with great advantage experimental methods. To him are ascribed the discovery of sulphuric acid, the first use of the word 'gas,' and the scientific use of the thermometer; he also studied profitably the fluids of the human body. His son published his works as *Ortus Medicinæ* (1648). See *Rommelaere's Etudes sur J. B. Helmont* (1868).



Forms of Helmets.

times decorated examples of the helmet; and still another variety is the burgonet. After the introduction of firearms, helmets naturally lost their utility, especially as a protection for the face. Their military use is now limited for the most part to heavy cavalry, lancers, and artillery, and is still further being discontinued. In warm countries special helmets of cork, pith, or

layers, and is therefore used for carving shell canoes. Most of the species come from hot regions. They are related to the tritons, whom they resemble in structure. The mouth of the shell is much narrowed by a thickening of the inner lip. **Helmholtz**, HERMANN VON (1821-94), German scientist, was born at Potsdam. He was elected professor of physiology at Königs-

Helmstedt, tn., Germany, in duchy of Brunswick, 24 m. by rail s.e. of Brunswick; has several mediæval houses. From 1574 to 1809 it was the seat of a (Protestant) university. Pop. (1900) 14,259.

Helmund, or HELMAND, riv., Afghanistan, rises on the s. of the Hindu-Kush, w. of Kabul, and flows for about 700 m. s.w., w., and n., receiving numerous tributaries, by which it drains the southern part of the country, and empties into the swampy Hamun depression in the s.w. of Afghanistan. The water-power of the river is used by numerous mills.

Helm Wind, in Cumberland. At certain times, when the wind is in the east, a helm-shaped cloud suddenly appears like a heavy bank along the range of Cross Fell; then, at a distance of one or two miles from the foot of the fell, a roll of cloud, called the 'helm bar,' appears suspended in mid-air, and parallel with the helm cloud. A cold

Greece. They formed the lowest class in the Spartan state, and were the property of the state, not of individuals. They were, however, assigned to cultivate the lands of individual Spartans, and paid the owners one half of the produce; the other half was their own property. Any Spartan could at any moment call on a helot to perform any service for him. In war they served as light-armed troops; and might be rewarded for good service with their freedom. But they were a constant danger to the state; and in 464 B.C. a general revolt occurred, which the Spartans only put down with great difficulty, after a war lasting several years.

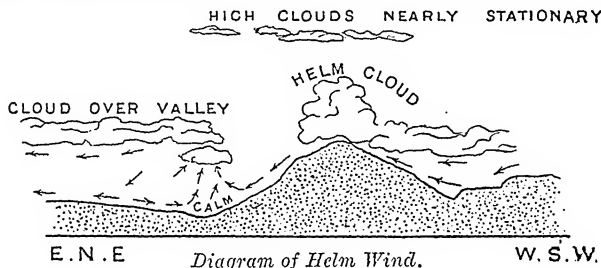
Helpmakaar, tn., former military post in Natal, British S. Africa, not far from Ladysmith; figured in Zulu war of 1879, and in the Boer war of 1900-2.

Helps, SIR ARTHUR (1813-75), English essayist, born at Streatham, near London. He was appointed clerk of the Privy Council (1860), an office

Helsingfors, cap. of Finland and of prov. Nyland, over 260 m. by rail w. of St. Petersburg, on the Gulf of Finland. The town is remarkably well built, being mostly of modern construction (since 1808). It is the seat of the Finnish university (2,460 students in 1903), a polytechnic (400 students), an observatory, a library of 200,000 vols., the senate house, a Lutheran cathedral, and an immense Russian cathedral, the seat of the Orthodox archbishop of Finland. It is a famous intellectual centre. Helsingfors has a considerable trade in timber, corn, and butter. In 1904 its imports were valued at £2,635,015, while its exports were valued at £340,744. The entrance to the port is guarded by the strong fortress of Sveaborg. Helsingfors is also a busy industrial centre, producing sugar, beer, linen, tobacco, carpets, spirits, and iron goods. It is a seaside resort for St. Petersburg. Helsingfors was founded by Gustavus Vasa of Sweden in the 16th century (1520-59), about 4 m. N.E. of the present site, and was removed by Christina, daughter of Gustavus Adolphus, in 1640. It was captured and burnt by the Russians in 1728; finally taken by them in 1808; made the capital of the principality in 1819, and the seat of the Finnish university (transferred from Åbo) in 1827. In 1855 it was attacked by the British, and Sveaborg was bombarded without much effect. Baron Nordenskiöld was born here. Pop. (1900) 93,217; or, including Sveaborg, 97,051.

Helsingör, or ELSINORE, seapt. and largest tn. of Denmark after Copenhagen, on the Sound opposite (3½ m.) to the Swedish town of Helsingborg. North of the town is the fortress of Kronborg (1574-83), associated with *Hamlet*. North-west of the town is the former royal château of Marienlyst, now a bathing establishment. The harbour is rarely frozen, and admits ships of twenty-feet draught. The industries include cloth-weaving, net-making, and shipbuilding. Here Denmark levied the Sound tolls from 1425 to 1857. Pop. (1901) 13,902.

Helst, BARTHOLOMEUS VAN DER (1613-70), Dutch painter, was born probably at Haarlem, but lived nearly all his life and died at Amsterdam, where he was one of the founders of the painters' guild. He was chiefly a painter of portraits, and in the opinion of Sir Joshua Reynolds these are of a very high order. His most famous picture, known as *The Banquet of the Civic Guard*, or *The Peace of Münster*, is now at Amsterdam. The National Gallery, London, has a *Portrait of a Lady* by him.



wind rushes down the sides of the fell, and blows with great force till it reaches a spot nearly under the helm bar, where it suddenly falls calm. The space between the helm cloud and the bar is usually quite clear, with blue sky. A ricochet or rebound of the air at the foot of the fell produces the bar, which indicates the point at which condensation takes place. See Marriott's 'Report on the Helm Wind Inquiry,' in *Quart. Jour. Roy. Met. Soc.*, vol. xv. p. 103.

Heloderma, a genus of American lizards which are poisonous. The salivary glands of the lower jaw are converted into poison sacs, comparable to those of poisonous snakes; and the teeth form grooved fangs. The coloration is a conspicuous combination of black and orange. The skin is rough and warty. The food consists of worms, centipedes, frogs, and the eggs of lizards. The bite has been known to result in death in the case of man, and is apparently always severe.

Héloïse. See ABELARD.

Helotes, or HELOTS, the serf population of Laconia in ancient

which he held until his death. To Helps Queen Victoria entrusted the revision of the Prince Consort's *Speeches* (published 1862), and the preparation for press of her *Leaves from the Journal of our Life in the Highlands* (1868), etc. Helps's literary reputation rests mainly upon his essays, particularly on the *Friends in Council* (1847-9, 1853, and 1859), dialogues upon social and intellectual subjects. He also published *The Claims of Labour* (1844), *Companions of my Solitude* (1851), *Casimir Marremma* (1870), *Brevia* (1871), *Conversations on War* (1871), *Thoughts upon Government* (1872), *Some Talk about Animals and their Masters* (1873), and *Social Pressure* (1875). To history he contributed *Conquerors of the New World* (1848) and *Spanish Conquests in North America* (1855-61; new ed. 1904).

Helsingborg, seapt. tn., in Malmöhus co., Sweden, on the Sound, opposite Elsinore in Denmark. It is one of the oldest towns in Scandinavia. Here, in 1710, Stenbock won a victory over the Danes. Pop. (1900) 24,670.

Helston, mrkt. tn. and bor., Cornwall, England, 10 m. N.N.W. of the Lizard; is visited for the scenery. Pop. (1901) 3,088.

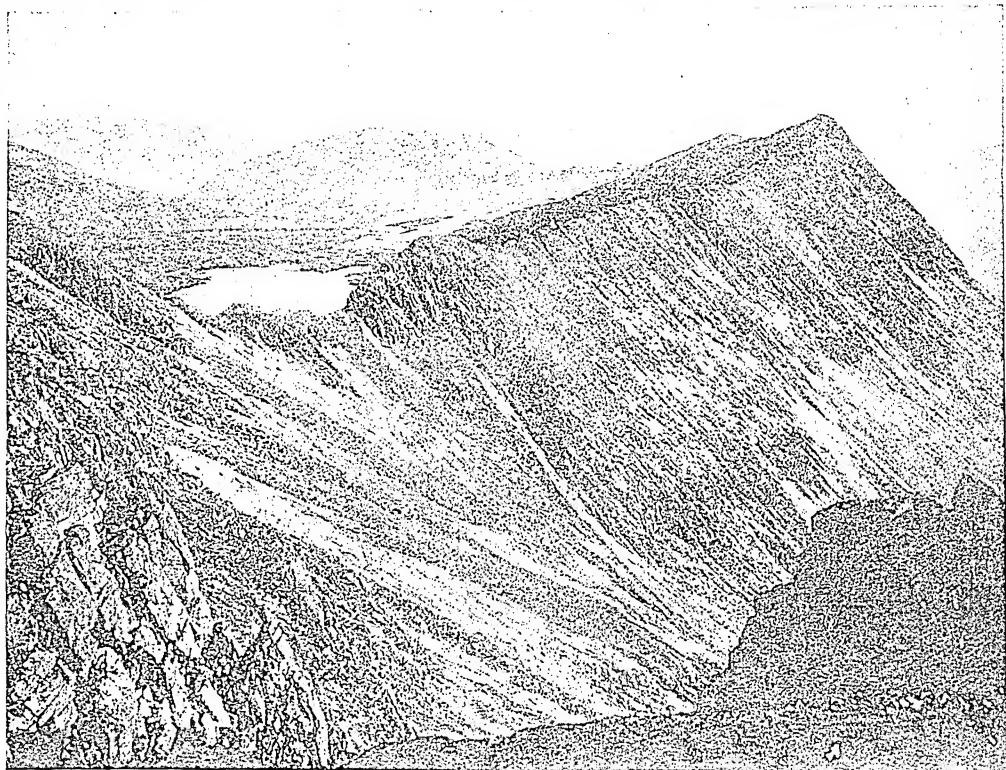
Helvella, a genus of large terrestrial fungi belonging to the family of the Ascomycetes. They are characterized by the sporidia being contained in small cases or asci, by the hymenium being even and exposed, and by the pileus having free margins. The common helvel (H. *crispa*) is of a pale colour, and occurs in groups in the late autumn in woods. The pileus has a crinkled appearance,

Heivetii, a Celtic nation who lived between Mt. Jura, the Lake of Geneva, the Rhone, and the Rhine as far as Lake Constance. In 107 B.C. they routed a Roman army on the Lake of Geneva; in 101 they invaded Italy with the Cimbri; in 58 they endeavoured to invade Gaul, but were forced back by Cæsar; and after that they were Romanized.

Helvétius, CLAUDE ADRIEN (1715-71), French philosopher, one of the Encyclopédistes, born at Paris; was appointed farmer-general of the taxes (1738), but

Helwan, a health resort of Egypt, 14 m. S.E. of Cairo, and near r. bk. of Nile. See W. Page May's *Helwan* (1901).

Hely-Hutchinson, SIR WALTER FRANCIS (1849), English colonial administrator, was born at Dublin. In 1877 he was appointed colonial secretary of the Barbados. In 1884 he was promoted to be lieutenant-governor of Malta, which position he filled until 1889, when he became governor of the Windward Is., W. Indies. He was appointed governor of Natal in 1893, when he



Helvellyn: the Striding Edge.

(Photo by P. Abraham, Keswick.)

and the stem is semi-pierced with holes.

Helvellyn, second highest mountain (3,118 ft.) in the Lake District of England, between Ambleside and Keswick, Cumberland. Poems by Sir Walter Scott and Wordsworth record the fate of Charles Gough and the fidelity of his dog in February 1805.

Helvetia. See SWITZERLAND.

Helvetic Republic, the government set up by the French Directory within the Swiss Confederation, which lasted from March 1798 to February 1803. Lucerne was made the capital of the state.

resigned to become chamberlain to the queen. It was after this that he associated with Diderot, D'Alembert, and Holbach; and in 1758 appeared his *De l'Esprit* (Eng. trans. 1759), in which he travesties Locke, teaching that sensation is the source of all intellectual activity, and that the prime motive of human conduct is self-gratification. The work was condemned by the Sorbonne, and ordered to be burnt. He also wrote *De l'Homme* (1772; Eng. trans. 1777). See Morley's *Diderot and the Encyclopédistes* (1878).

inaugurated responsible government there. Since 1901 he has been governor and commander-in-chief of Cape Colony.

Hemans, FELICIA DOROTHEA (1793-1835), English poetess, born at Liverpool. Her first book of poems was published in 1808, followed in 1812 by a volume of some promise, *Domestic Affections, and other Poems*. Mrs. Hemans visited Scotland in 1829, and enjoyed the friendship of Scott, Jeffrey, and Wordsworth. Her work is essentially feminine in character, appeals to the heart rather than to the intellect,

is marked by taste and elegance, but lacks restraint, vigour, and compression. She died in Dublin. Her chief works are *The Sceptic* (1820); *Vespers of Palermo*, a tragedy (1823); *Siege of Valencia* (1823); *The Last Constantine* (1823); *Lays of Many Lands* (1825); *Records of Women*—her best work (1828); *Songs of the Affections* (1830); *Hymns for Childhood* (1834). See complete edition of the *Works of Mrs. Hemans*, with a *Memoir*, by her sister, Mrs. Hughes (7 vols. 1839); *Memorials of Mrs. Hemans*, by H. F. Chorley (1836); *Recollections* by Mrs. Lawrence (1836); *Poetical Works*, with critical memoir by W. M. Rossetti (1873).

Hematite. See HEMATITE.

Hemel Hempstead, mkt. tn. and bor., 6 m. N.W. of St. Albans, Herts, England. The industries comprise paper-making, straw-plaiting (now declined), iron-founding, tanning, and brewing. Pop. (1901) 11,264.

Hemichorda, a small class of wormlike animals, which show certain vertebrate or chordate characters. The most important forms are the members of the genus *Balanoglossus*.

Hemicrania. See MIGRAINE.

Heming, or HEMMINGE, JOHN (d. 1630), English actor, supposed to have been born at Shottery, Warwickshire; was fellow-player of Shakespeare; also manager of the king's company of players, and part proprietor of the Globe and Blackfriars theatres. He produced seven of Shakespeare's plays at Whitehall (1613); also performed in masques and comedies by Ben Jonson. He was joint editor with Condell of the first folio of Shakespeare's plays (1623).

Hemiplegia, a paralysis of the parts of the body supplied by the motor nerves of one side. The lesion may be a hemorrhage, a tumour, an injury, or the occlusion of a vessel. The paralysis may be partial or complete, but it is seldom uniform. Thus the movements of the eyeballs remain perfect, and the leg usually retains more power than the arm. The thoracic and abdominal muscles are seldom much affected. When the paralysis is right-sided aphasia often results, since the centres for speech lie in the left cerebral hemisphere. If the face be involved, the wrinkles and facial lines are effaced, and the mouth is pulled towards the unaffected side. The paralyzed arm soon drops limp and helpless to the patient's side. In most cases of hemiplegia the disease is situated high up in the brain cortex, so that all the fibres passing to the other side of the body are affected. When the onset of hemiplegia is sudden there is often loss or im-

pairment of consciousness. While the hemiplegia exists, the reflexes are exaggerated; and when the condition persists for two or three months, more or less rigidity of the muscles results from secondary contraction. Beyond slight numbness, there is seldom in hemiplegia any disturbance of special senses or of ordinary sensation. The condition of hemiplegia is always serious and alarming, and the prognosis should be guarded. The first symptoms of returning power are generally shown in the leg.

Treatment necessarily varies with the cause. Injuries and tumours may require surgical interference; hemorrhage calls for styptics, and the application of cold to the head, with diminution of arterial tension by free purgation. Iodide of potassium and mercury are serviceable in specific cases. In all, prolonged rest and careful attention to hygienic conditions are imperative.

Hemiptera, an order of insects known as bugs. They all have a sucking mouth furnished with a long beak. There are nearly always four wings, though these are not infrequently absent in certain generations, as in aphides, or in the female sex, as in scale insects. The anterior wings in many cases differ from the posterior, and are more or less like wing-covers; in consequence they sometimes receive the name of hemelytra. Some authors prefer the term *Rhynchota* to *Hemiptera*. The young show a general resemblance to the adult, save for the absence of wings, which gradually develop as the insect becomes older. The *Hemiptera* live upon the juices of plants or animals, and have a force-pump arrangement in the head whereby the secretion of the salivary glands is pumped into the wound made by the setæ of the beak. The fluid so introduced is presumably of an irritating nature, and increases the supply of blood or fluid in the vicinity of the wound. In most cases 'stink glands' of some kind are present, and give the insects their frequently offensive smell. *Hemiptera* are divided into two sub-orders—*Heteroptera* and *Homoptera*.

Hemlock, a native British plant belonging to the order Umbelliferae. The common hemlock (*Conium maculatum*) is a tall plant, with daintily-cut, decomposed, glossy green leaves, arising from a smooth stem with purple markings. It bears its flowers in summer, in compound umbels, with bracts half-way round the stem, at the base of the partial umbels. The whole plant has a strong, disagreeable, mouselike odour. It is a powerful poison by reason of the alka-

loid conine which it contains, and was the poison taken by Socrates. The leaves and fruit are occasionally used in medicine, an extract, juice, and tincture being prepared. The action of hemlock in poisonous doses is to paralyze the motor nerves and the respiratory centres.



Hemlock.

1, Small leaf; 2, flower; 3, petal; 4, ovary; 5, fruit, side view; 6, longitudinal section; 7, transverse section.

Hemmingsen, NIELS (1513-1600), Danish theologian, born in the island of Laaland; gained the favour of Melanchthon at Wittenberg, and became professor of Greek there (1543), and of diallectics (1544); then in 1572 professor at the University of Copenhagen, which he made one of the most famous Protestant high schools in Europe. He was one of the translators of the first Danish version of the Scriptures.

Hemorrhage. See HÆMORRHAGE.



Hemp.

1, Male plant; 2, female; 3, male flower; 4, female; 5, pistil; 6, seed; 7, section.

Hemp, a plant of the *Urticaceæ* or *Cannabinaceæ*. There is only one species (*Cannabis sativa*), an erect growing plant eight or ten feet in height, occurring in the wild state in Syria, Northern India, Arabia, and Turkey. It secretes a resinous juice possessing narcotic and intoxicating

properties (see *HASHISH*); but this product is not found in hemp grown in Great Britain. The plant bears a general resemblance to the common stinging nettle—to which it is, like hops, botanically allied—and is dioecious. The stem is square, and the leaves are divided into fine, narrow, taper-pointed, rough, serrated lobes. Hemp seed is a favourite food for poultry and for cage birds. It is, however, principally for its fibre that hemp is cultivated. This is obtained by rotting the stems of the plant, on the same principle as is followed in separating flax fibre. (See *FLAX*.) Hemp fibre is used for sailcloth, packsheets, ropes, caulking of ships, etc. The chief supplies come from Russia and the Philippine Is. (Manila). Hemp was extensively grown towards the end of the 18th century in Lincolnshire, Notts, and Cambridgeshire. Its cultivation resembles that of flax. From two to four pecks constitute sufficient seeding for one statute acre. The young plants are thinned out when they are three or four inches high, and are left from eight to twelve inches apart. If intended for fibre alone, the stems are all pulled and treated alike. If for seed, the male plants are pulled first, in order to secure the fibre in the best condition; and the female or seed-bearing plants are left to ripen for some weeks longer.

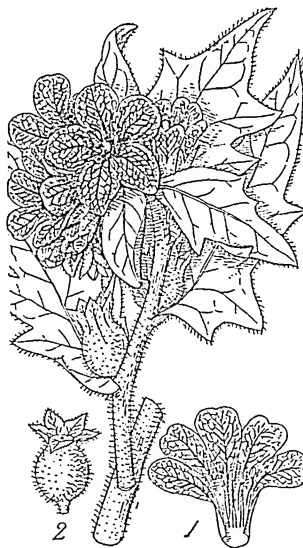
Hemphill, CHARLES HARE (1849), Irish barrister, and for some time H.M. first serjeant-at-law, was born at Cashel. From 1892 to 1895 he was solicitor-general for Ireland; and after unsuccessfully contesting the West Derby division of Liverpool (1886), and Hastings (1892), was elected M.P. for North Tyrone (1895-1905). In January 1906 he was made a baron.

Hems, or HOMS (anc. *Emesa*), city, Syria, near r. bk. of Orontes, 60 m. N. of Tripoli, was noted for its temple of the sun. It was the scene of the defeat of Zenobia by Aurelian in 272, and of the Turks by Ibrahim Pasha in 1832. Famous for its fruit (especially grapes) and its horses. There are manufactures of cotton and woollen goods. Pop. estimated at 60,000.

Hemsey, WILLIAM BOTTING (1843), English botanist, born at East Hoathley in Sussex, and in 1860 entered Kew Herbarium, where he was promoted to be principal assistant and acting librarian in 1890. He has devoted most of his time to systematic and geographical botany. He is the author of the *Phanerogamic Botany of the Challenger expedition* (1885), and of the 'Botany' of Salvin and Godman's *Biologia Centralis-Americana* (1879-88).

Hemsterhuis. (1.) TIBERIUS (1685-1766), Dutch scholar, born at Groningen; was professor of Greek at Franeker (1720) and at Leyden (1740). He edited several Greek authors—e.g. the *Onomasticon* of Pollux (1706), *Select Dialogues* of Lucian (1708), *Plutus* of Aristophanes (1741). See Ruhnken's *Elogium Hemsterhusii* (1768); also *Anecdota Hemsterhusiana*, edited by Geel (1825). (2.) **FRANZ** (1720-90), Dutch philosopher, son of the above, wrote several works on aesthetics and moral philosophy. His aesthetic views were in part adopted by Goethe.

Hemy, CHARLES NAPIER (1841), English marine painter, born at Newcastle-on-Tyne, where he studied art under W. B. Scott, and then under Baron Leys at Antwerp. From 1870 to 1881 he painted the lower reaches of the Thames, and in 1883 established himself at Falmouth, where he produces his fine seascapes, and studies the character of his work and shipping. His *Pilchard* is in the Tate Gallery, London. Other pictures are *Homeward*, at Birmingham; *Home Wind*, in Australia; *Birds of Prey* (1901), at Leeds; and *The Crab Merchant* (1904), at Sydney.



Henbane.

1. Corolla, open; 2. calyx.

Henbane, a genus of plants belonging to the order Solana-ceae; more particularly the common British species *Hyoscyamus niger*, a tall herb, with large hairy leaves, often ten inches long, bearing in summer numerous creamy flowers with purple markings. The whole plant has a strong, disagreeable odour. It is

a powerful poison by reason of the alkaloids hyoscyamine and hyoscyne which it contains. Henbane is used in small doses in medicine, chiefly as a sedative, in the form of the extract, the juice, or the tincture.

Henderson, city, Kentucky, U.S.A., co. seat of Henderson co., on the Ohio, 100 m. S.W. of Louisville. Manufactures tobacco, cotton and woollen goods, and has coal mines. Pop. (1900) 10,272.

Henderson, ALEXANDER (1583-1646), Scottish divine, born in the parish of Creich, Fifeshire. He took a leading part in opposing the attempt to force a liturgy on the Scottish Church (1636), and from that time he was the foremost Presbyterian divine of his day. He was moderator of the General Assembly in 1638; was made minister of the High Kirk, Edinburgh, in 1639; and was one of the commissioners who arranged the pacification of Berwick (1639). He accompanied the Scottish Covenanting army into England (1640), and became chaplain to Charles I. in 1641. He drafted the Solemn League and Covenant, and took an active part in the work of the West-part Assembly of Divines (1643). He published *Bishops' Doom* (1638; reprinted 1762), and *Sermons, Prayers, and Pastoral Addresses* (ed. R. T. Martin, 1867). See *McOrie's Life* (1846).

Henderson, DAVID BREMNER (1840-1906), American politician, born at Old Deer, Aberdeenshire, Scotland, but went to America when quite young. He espoused the cause of slavery abolition; and in 1882 became a member of Congress, and in 1899 was elected speaker, which office he held for several terms.

Henderson, GEORGE FRANCIS ROBERT (1856-1903), soldier and military critic; acted as director of military intelligence in S. Africa (1900-1), and was engaged on the official history of the war at the time of his death. He was for many years director of military art and history at the Staff College, and his *Life of Stonewall Jackson* is a classic.

Henderson, JOHN (1747-85), an English actor, known as the 'Bath Roscius,' born in Cheapside, London. His first appearance was in Bath as Hamlet (1772), and in 1777 he acted Shylock at the Haymarket, London, when he was engaged by Sheridan for Drury Lane. He was painted by Gainsborough and Romney. See *Life of John Henderson* (1778), ascribed to Tom Davies.

Henderson, THOMAS (1798-1844), Scottish astronomer, born at Dundee; was appointed in 1832 royal astronomer at the Cape of Good Hope, but resigned in 1833. His observations there gave the

first authentic evidence of stellar parallax, and he announced his result for α Centauri, Jan. 3, 1839. On Oct. 1, 1834, he was nominated the first astronomer-royal for Scotland, and made in ten years, at the Calton Hill observatory, 60,000 observations of planets and zodiacal stars, which were published in 1838-43 (new ed. by Piazzì Smyth, 1843-52).

Hending, PROVERBS OF, a series of middle English six-lined stanzas (c. 1300), each stanza being closed by the addition of a proverb attributed to Hending, a traditional wise man. See *Reliquie Antiques* (ed. Wright and Halliwell), vol. i.; and Wright's *Essays on the Literature of the Middle Ages* (i., iv.).

Hendon, vil., Middlesex, England, 8½ m. N.W. of St. Paul's. The 'Old Welsh Harp' is a tavern much frequented by holiday-makers. Manufacture of mineral waters. Pop. (1901) 22,450.

Hengist (d. 489) and **Horsa** (d. 455), princes of the Jutes who landed at Ebbsfleet, on the Isle of Thanet (449), having been invited by Vortigern to help him in repelling the Picts and Scots; afterwards they turned against the Britons themselves. The story is largely mythical. Horsa (= horse?—a sacred animal to the ancient Saxons) was defeated and slain at Aylesford. Hengist (= stallion?) continued the war, and declared himself king of Kent (457).

Hengshan. (1.) One of the four sacred mountains of China, on the border land between Chi-li and Shan-si, at present not identifiable with any particular mountain. (2.) Another of the four sacred mountains, in Hu-nan, about 3,000 ft. high, and about lat. 27° N., long. 112° E.

Hengstenberg, ERNST WILHELM (1802-69), German theologian, born at Fröndenberg in Westphalia; became the champion of the strictest Lutheran orthodoxy. In 1826 he became professor at Berlin, was the most bitter opponent of the new liberal school of Scripture interpretation, and attempted to have Gesenius, Wegscheider, De Wette, and others deprived of their chairs. Chief works: *Beiträge zur Einleitung ins Alte Testament* (3 vols. 1831-9; Eng. trans. 1847); *Christologie des Alten Testaments* (2nd ed. 1854-7; Eng. trans. 1854-8), and *Commentaries on the Psalms, Apocalypse, and Gospel of St. John* (all trans. into English). See Bachmann and Schmalenbach's *Hengstenberg* (1876-92).

Henin-Liétard, tn., dep. Pas de Calais, France, 12 m. N.E. of Arras; has coal mines, sugar refineries, and tanneries. Pop. (1901) 14,327.

Henle, FRIEDRICH GUSTAV JAKOB (1809-85), German pathologist and anatomist, born at Fürth in Bavaria; became assistant to Johannes Müller at Berlin (1832), then professor of anatomy at Zürich (1840), and in 1844 professor of anatomy, physiology, and pathology at Heidelberg. In 1846 he published *Handbuch der Rationellen Pathologie* (1846-53; Eng. trans. 1853), in which, for the first time, physiology and pathology were treated as branches of one science. He then became professor at Göttingen (1852), where he published his chief work, the *Handbuch der systematischen Anatomie des Menschen* (2nd ed. 1876-9). See *Life*, in German, by Merkel (1891).

Henley, JOHN (1692-1756), known as 'Orator Henley,' born at Melton Mowbray, Leicestershire; began to preach in London in 1716. Appointed to the living of Chelmondiston, Suffolk (1724), he, two years later, returned to London and rented a room, where, from a 'gilt tub,' he preached sermons on Sunday mornings; also gave orations on Sunday evenings and during the week. He drew immense crowds, whom he amused by his buffoonery. He published several works, curious mixtures of eloquence and rhodomontade, notably *Oratory Transactions* (1728), and a poem, *Esther* (1714).

Henley, WILLIAM ERNEST (1849-1903), English critic and poet, born at Gloucester. He was editor of *London* (1877-8), of the *Magazine of Art* (1882-6), of the *Scots* (afterwards the *National Observer*) (1888-93), and of the *New Review* (1893-8). He also edited the series *Tudor Translations*. His original works include *Book of Verses* (1888); *Views and Reviews—Literature* (1890); *Song of the Sword* (1892); *The Centenary Burns* (with T. F. Henderson, 1896-7); *The Works of Lord Byron* (only 1 vol., *Letters*, published 1897); *English Lyrics* (1897); *Poems* (1898); *The Poetry of Wilfrid Blunt* (1898); *London Types* (with W. Nicholson, 1898); *For England's Sake* (1900); *The Edinburgh Shakespeare Folio* (1901-4); *Hawthorn and Lavender* (1901); *Views and Reviews—Art* (1902); and the plays *Deacon Brodie*, *Beau Austin*, *Admiral Guineá* (1892), and *Macaire* (1895), these in collaboration with Robert Louis Stevenson. He was a lifelong invalid, and much of his work was done under conditions that would have crushed an intellectually weaker man.

Henley-on-Thames, mrkt. tn. and munic. bor., 6 m. N.E. of Reading, Oxfordshire, England; is famous for its annual regatta in July. Pop. (1901) 5,984.

Henna, a substance used in the East for dyeing the nails and beard, is obtained from the small white fragrant flowers of a tropical shrub or tree, *Lawsonia alba*, the henna plant, which is grown under glass in Britain. It thrives in a light, peaty soil and a fairly high temperature.

Hennebont, tn., dep. Morbihan, France, 5 m. N.E. of L'Orient. The chief industry is shipbuilding. Pop. (1901) 8,702.

Hennegau, or HENNEGOUWEN, Belgium. See HAINAULT.

Henner, JEAN JACQUES (1832-1905), French painter, born at Bernwiller (Alsace), and obtained (1858) the Grand Prix de Rome. He was one of the most poetic and realistic figure artists of the French school, especially of the nude—his chief works being his *Biblis Changée en Source* (1867), in the museum of Dijon; and his *Chaste Suzanne* (1865), in the Luxembourg, Paris. Others are *Portrait* (of himself), in the Uffizi at Florence; *Naiades* (1875), in the Luxembourg; *The Levite Ephraim* (1898); *The Dream* (1900).

Henningsen, CHARLES FREDERICK (1815-77), soldier and author, born in England of Scandinavian descent; embraced the Carlist cause (1834), and commanded the cavalry under Don Carlos (1837), subsequently serving as a volunteer with the Russian army in Circassia, with Kosuth in Hungary, and with the filibuster Walker in Central America. During the American civil war Henningsen commanded a Confederate brigade. He wrote numerous accounts of his adventures, besides *The White Slave* (a romance) and *The Past and Future of Hungary* (1852).

Henrietta Maria (1609-69), the youngest daughter of Henry IV. of France and Marie de' Medici, married Charles I. of England in 1625. Between 1629 and 1639 (the period of government without Parliament) she opposed Laud's proclamation against Roman Catholic recusants, and raised money for the royal cause in the bishops' wars (1639). After the meeting of Parliament she encouraged the army plot, attempted to save Strafford, and urged Charles to arrest the five members. From 1644 to 1660 she lived in France. At the restoration she returned to England, but in 1665 again went to France. See Bailion's *Henriette-Marie de France* (1877) and J. A. Taylor's *Life of Queen Henrietta Maria* (1905).

Henry, the practical electric unit of self-induction. It represents the induction in a circuit when the inducing current changes at the rate of one ampere per second, and the E.M.F. induced is one volt. See ELECTRICITY, CURRENT.

Henry I. (1068-1135), king of England, the younger son of William I. and Matilda, was born at Selby in Yorkshire. He succeeded his brother, William Rufus, in 1100, and strengthened his position by marrying Edgyth (known as Matilda), daughter of Malcolm, king of Scotland, and of Margaret, grand-daughter of Edmund Ironside. His charter of liberties, his recall of Anselm, and his arrest of Flambard testified to his prudence and sagacity. Robert of Belesme persuaded Robert, Henry's elder brother, to assert his claims to the English throne. After suffering an overwhelming defeat at Tinchebrai (1106), Robert was imprisoned in Cardiff Castle, and Normandy was united to England. William, Robert's son, secured the assistance of Louis VI., king of France, and the counts of Flanders and Anjou. To defend himself against this combination, Henry married his daughter, Matilda, to the Emperor Henry V., gained over the Count of Anjou, and in 1119 defeated the French king at Brémule (Brennville). William, Henry's only son, was drowned in 1120 in the *White Ship*. During these years Henry I. had been busy with religious disputes, especially the investiture question. (See ANSELM.) The Curia Regis became the centre of an administrative system by which the counties and the sheriffs were connected with the central government. The financial side of the Curia Regis, known as the Exchequer, was developed. A monastic revival took place during the reign, and the Austin canons and the Cistercians settled in England. Henry died suddenly at Angers in Normandy, and was buried at Reading.

Henry II. (1133-89), king of England, was the eldest child of Matilda, daughter of Henry I., and of Geoffrey Plantagenet, and succeeded Stephen as king in 1154. From his father and mother he inherited Anjou, Touraine, Normandy, and Maine; while through his wife, Eleanor of Aquitaine, he secured Poitou, Périgord, Limousin, and Gascony, together with claims on the county of Toulouse, and a nominal suzerainty over the land on the west bank of the Rhone. A vigorous, hard-working man, skilled in diplomacy, and a lover of the law, Henry revoked his predecessor's grants of crown lands, destroyed the 'adulterine' castles built by the barons, expelled all mercenaries, and abolished the 'fiscal' earldoms. To free himself from dependence on the barons, he took from them scutage in lieu of personal service

for forty days (1159). Wales and Scotland were forced to recognize his authority. A quarrel with Becket led, however, to the Constitutions of Clarendon (1164), the effect of which was in great part destroyed by the murder of Becket (1170). To avoid the papal legates, Henry entered on the conquest of Ireland (1171). In 1166 the Assize of Clarendon compelled all men to come, when required, to the county courts, and brought the barons within reach of the law. In 1170 the Inquest of Sheriffs was followed by the dismissal of most of the sheriffs. The barons rose with the king's own sons, William the Lion of Scotland, Philip of Flanders, and Matthew of Boulogne. But the rebellion was speedily crushed by Henry II., who, having captured William the Lion, forced him to sign the treaty of Falaise (1174). In 1176 the Assize of Northampton, in 1181 the Assize of Arms, in 1184 the Assize of Woodstock, were issued. By these laws the baronial power was still further checked, the people were armed, and the king's supremacy over the forests firmly established. In 1188, to raise money for a crusade, the Saladin tithe was collected and personal property was taxed. Henry's later years were full of trouble. Philip Augustus, the French king, intrigued with Henry's sons against their father, who at length, worn out and disillusioned, died at Chinon. Henry's reign marks the development of the jury system, which was now used for judicial and financial matters. See Green's *Henry II.* (1888), Norgate's *The Angevin Kings* (1887), and Ramsay's *The Angevin Empire* (1903).

Henry III. (1207-72), king of England, the eldest son of John and Isabella, was born at Winchester, and was crowned king of England at Gloucester on Oct. 23, 1216. As Henry was only a child, England was governed till 1232 by ministers. William Marshal (1216-19) and Hubert de Burgh overthrew the French, who were endeavouring to convert England into a French province. Magna Carta was reissued, and a forest charter was put forth. Pious, and a lover of art and literature, Henry III. so far represented the age in which he lived; but he was faithless, wanting in energy, and irresolute. Consequently his reign was full of troubles. In 1232 Hubert de Burgh was dismissed, and Peter des Roches, bishop of Winchester, who succeeded Hubert, was so unpopular that in 1234 he was removed from power. In 1236 Henry married Eleanor of Provence, and a host of Provençals invaded England. From this time

the opposition of the clergy and barons became more and more pronounced. Papal exactions led Grosseteste, bishop of Lincoln, to take up an attitude of opposition; while Henry's failure in France (1242-3), and his refusal to fill up the great offices of state, increased the irritation of the barons. At the same time, the rapacity of the sheriffs threw the knights of the shire on the side of the opposition. The crisis came to a head through Henry's acceptance of the crown of Sicily for his second son, Edmund. In 1258 a Parliament, known as the 'Mad Parliament,' was called to Oxford. Leaders were found in Richard of Clare, Earl of Gloucester, and in Simon de Montfort, who had married the king's sister. The Provisions of Oxford were drawn up, a period of reform was inaugurated, and from 1258-64 a struggle took place between the king and the barons. A treaty at Paris in 1259 removed all outstanding difficulties over foreign questions, and in 1264 Henry and the barons referred their disputes to Louis IX. of France. By the Mise of Amiens (January 1264) Louis annulled the Provisions of Oxford. Civil war ensued; Henry was defeated and captured at the battle of Lewes (May 1264), and promised, in the Mise of Lewes, to accept the Provisions of Oxford. To strengthen his position, Simon called a Parliament in 1264, at which four knights from each shire appeared; in 1265 burgesses from certain towns were summoned, together with knights of the shire. But on Aug. 4, 1265, Simon was defeated and killed at Evesham by Prince Edward. The Dictum de Kenilworth (1266) and the statute of Marlborough (1267) brought the struggle to a close. In this reign the friars settled in England, and taught at Oxford. During the barons' war Llewelyn of Wales had supported the barons, and it was not till 1267, by the treaty of Shrewsbury, that Wales was pacified. On Nov. 16, 1272, Henry III. died at Westminster, and was buried in the abbey.

Henry IV. (1367-1413), king of England, son of John of Gaunt, was born at Bolingbroke in Lincolnshire, and succeeded Richard II. in 1399. Besides aiding the Teutonic Knights against the heathen Prussians, he fought in the East (1392-6) in crusading and other enterprises. For the help he gave Richard II. in putting down the Duke of Gloucester's rebellion he was made Earl of Hereford; but in the following year (1398), when he quarrelled with Norfolk, he was banished from the kingdom (*cf.* Shakespeare's *Richard II.*). The king

having confiscated his estates on the death of John of Gaunt, Henry landed in England to recover them by force, though the issue proved to be the deposition of Richard II. Soon after Henry's accession a rebellion broke out in Wales, headed by Owen Glendower, and the Scots crossed the Border. The latter were overthrown at Homildon Hill (1402); but the Percies quarrelled with Henry over the ransom of the Scottish captives, and joined Glendower. At the battle of Shrewsbury (1403), Henry (Hotspur) Percy was slain, and the Welsh were defeated. In 1405 Scrope, Archbishop of York, rebelled, but was easily overthrown; and in 1408, at Bramham Moor, the old Earl of Northumberland was killed, and the Percies were subdued. Meanwhile Henry had given Parliament considerable powers, and in 1407 the Commons gained the right of initiating money grants. In 1406 Prince James, the heir to the Scottish throne, was captured and detained in England for many years. Secure in the support of the church and of Parliament, Henry inaugurated a policy of opposition to the Lollards and an era of premature constitutional government. He died on March 20, 1413, at Westminster, and was buried at Canterbury. See Wylie's *England under Henry IV.* (1884-98).

Henry V. (1386-1422), king of England, son of Henry IV., whom he succeeded in 1413, was born at Monmouth. The Lollard movement caused the government anxiety, and Henry continued his father's repressive policy. Sir John Oldcastle (Lord Cobham), the Lollard leader, being executed as a heretic in 1417. Meanwhile the ravages of privateers from Normandy made an invasion of France popular. In September 1415 an English force landed in France, and on October 25 Henry won the battle of Agincourt. In 1417 a second invasion took place, and Rouen was captured. The murder of the Duke of Burgundy by the Armagnacs threw his son into close alliance with England (1419), and in 1420 the treaty of Troyes was signed. Henry became regent of France, with the right of succession, and married the French princess Catherine. For the rest of his life Henry was occupied in Anglicizing Normandy, and in checking risings in France against the English predominance. In 1421 the dauphin defeated and killed the Duke of Clarence (Henry's brother) at Beaugé, but in 1422 Henry captured Meaux. He died at Vincennes, and was buried in Westminster Abbey. See Kingsford's *Henry V.*

Henry VI. (1421-71), king of England, the son of Henry V., was born at Windsor, and became king in 1422. During his long minority (till 1442) the Privy Council, under the control of Parliament, governed the country. The Duke of Bedford, Henry V.'s eldest brother, was regent in France; and Gloucester, his youngest brother, was made protector of the realm; while Henry Beaufort wielded great influence. Bedford made a league with the dukes of Burgundy and Brittany, and won the battles of Crévant (1423) and Verneuil (1424). At the same time he sent James of Scotland back to his own land. Gloucester, however, endangered the Burgundian alliance by marrying Jacqueline of Hainault, cousin of the Duke of Burgundy, and had roused discontent in England by quarrelling with Henry Beaufort. Meanwhile Orleans (1428-29) was saved by Jeanne d'Arc. Though Henry VI. was crowned in Paris, the conclusion of peace between Charles VII. of France and Burgundy, together with the death of Bedford (1435), ruined the success of the English in France. Richard, Duke of York, and John, Lord Talbot, made courageous attempts to hold their own in Normandy and Guienne; but the influence of Margaret of Anjou, who married Henry VI. in 1445, the death of Beaufort in 1447, the foolish policy of Suffolk and Somerset, and the rising national feeling among the French, led in 1453 to (with the exception of Calais) the total loss of the English possessions in France. In 1455 the wars of the Roses opened with the first battle of St. Albans; and during the rest of Henry VI.'s reign the Yorkists, or supporters of Richard, Duke of York, fought against the Lancastrians, or supporters of the ruling dynasty. Jack Cade's rising in 1450 had testified to the incompetence and unpopularity of the government; and throughout the wars of the Roses the commercial classes sympathized with the Yorkist cause. The actual fighting was done by the nobles. After the Yorkist victory at Bloreheath (1459), followed by the Yorkist rout at Ludford-on-the-Teme, the Parliament at Coventry attainted the Yorkist leaders. In 1460 the Yorkist Earl of Warwick won the battle of Northampton, and captured Henry VI. In October 1460 York was declared heir to the throne; but on Dec. 31, 1460, he was defeated and slain at Wakefield, while Warwick was beaten at the second battle of St. Albans (Feb. 17, 1461). London was saved from capture by the Lancastrians through the energy of Edward, York's eldest

son, and of Warwick. Edward having won Mortimer's Cross, entered London (February 26), and was proclaimed king. In 1471 Henry VI. was murdered in the Tower of London.

Henry VII. (1457-1509), king of England, the son of Edmund Tudor and Margaret Beaufort, heiress of John of Gaunt, was born at Pembroke Castle. Henry succeeded to the crown after defeating Richard III. at the battle of Bosworth in 1485. In the following year he strengthened his position by marrying Elizabeth, daughter of Edward IV. (1486). He was himself descended on his mother's side from the Beauforts, the illegitimate descendants of John of Gaunt. To restore order, he enforced statutes against livery and maintenance, and set up a new court in 1487, known as the Court of Star Chamber, to keep down the nobles. In 1486 Lovel's plot was discovered, and in 1487 the rebellion of Lambert Simnel was suppressed by Henry's victory at Stoke, near Newark. On the Continent he endeavoured to check the attempts of Charles VIII. of France to conquer Brittany, and though he failed, he concluded an advantageous treaty at Etaples (1491). Ferdinand of Spain and Maximilian, the emperor, endeavoured to secure Henry's adhesion to a league against France, and Ferdinand used his influence to secure the expulsion of Perkin Warbeck, a Yorkist pretender, from Flanders. Though Warbeck was well received in Scotland, his attempt to stir up the west of England led to his capture in 1497, and his death in 1499. Henry was thenceforth secure on his throne. In 1496 he made an important commercial treaty with Flanders, overthrew some Cornish insurgents at Blackheath in 1497, and made a treaty with Scotland the same year. By Poynings's Law (1494) he had restored order to Ireland, and in 1496 he allied with Spain, without endangering his friendship with France. During his reign commerce and geographical enterprise were encouraged. His ministers and agents, such as Archbishop Morton, Empson and Dudley, played a notable part in raising money from the nobles, and the Star Chamber proved a most valuable instrument. Henry VII. died at Richmond. See Lord Bacon's *History of Henry VII.* (1622), and Gairdner's *Henry VII.* (1889).

Henry VIII. (1491-1547), king of England, the second son of Henry VII., was born at Greenwich. In 1509, the year of his accession, he married Catherine of Aragon, the widow of his brother Arthur. During those

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years (1509-29) foreign affairs engrossed most of the attention of the government. Henry joined the Holy League, and in 1513 won the battle of Guinegate and the battle of Flodden. In 1514, at Wolsey's suggestion, he made peace with France, and his sister married Louis XII. In 1518 Wolsey negotiated the treaty of London between the Emperor Charles V. and Francis I. Then the effects of the meeting between Henry VIII. and Francis I. on the 'Field of the Cloth of Gold' (1520) were nullified by Henry's meetings with Charles in England and at Gravelines. On the outbreak of war between Charles and Francis in 1521 Henry sided with Charles, and an English force under Surrey invaded France. It effected little, and after the capture of Francis at Pavia (1525) Henry and Charles became alienated, and in 1527 a French alliance was brought about by Wolsey's efforts. Wolsey and the Pope were regarded by the king as responsible for his failure to obtain a divorce against Catherine, and Wolsey was exiled to his diocese of York. In 1529 the famous reformation Parliament met, and sat for seven years. Henry was now bent on securing the divorce at all costs. At this time Thomas Cromwell became Henry's principal minister, while Crammer was made Archbishop of Canterbury. In 1533 Crammer declared Henry's marriage with Catherine of Aragon invalid, and the king at once married Anne Boleyn. Parliament then passed a number of enactments completely abrogating the papal authority in England. In 1535 it passed the Act of Supremacy, making Henry supreme head of the Church of England. Henry was now absolute, and till the end of his life he pursued a course unrestrained by any constitutional checks. In 1536 Anne Boleyn was executed on the ground of conjugal infidelity. Henry then married Jane Seymour, and a son, afterwards Edward VI., was born in 1537.

Meanwhile the reformation movement advanced. While an English translation of the Bible was set up in all churches, the Ten Articles were, in 1536, published with a view of quietening the consciences of Englishmen. In 1536 the lesser monasteries were dissolved, with the full assent of king and Parliament. This act roused great discontent, and outbreaks took place in various parts of England, the Pilgrimage of Grace being the most serious. Having suppressed this rising, Henry set up the Council of the North, and began to dissolve the greater monasteries. Their

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wealth went, for the most part, into the pockets of the king and his friends. Henry now agreed with Cromwell that an alliance with the North German Protestant princes was desirable, and married in 1540 Anne of Cleves. Finding that this marriage had been rendered unnecessary by the outbreak of war between the emperor and Francis I., Henry now turned against Cromwell. He divorced Anne of Cleves, and in July 1540 Cromwell, whose influence had long been declining, was executed. The party of Roman Catholic reaction, headed by the Duke of Norfolk, thus triumphed, and Henry married Catherine Howard, niece of the duke. After the execution of Catherine Howard for conjugal infidelity, Henry married Catherine Parr, who was a supporter of Protestantism. In 1536 Wales was incorporated, and given representatives in the English Parliament. See Brewer's *The Reign of Henry VIII.* (1884); *Letters and Papers... of the Reign of Henry VIII.*, Rolls Series (1862-1905); Hall's *Henry VIII.*, in *Lives of Kings Series* (1904), and Hume's *The Wives of Henry VIII.* (1905).

Henry I. (c. 1005-60), king of France, was the third son of King Robert I., and a descendant of Hugh Capet; he ascended the throne in 1031. He granted Burgundy to his younger brother; he failed to subdue the Count of Blois; he quarrelled with Robert, the powerful Norman duke, and when he invaded Normandy, was defeated at Mortemer (1054) and Varaville (1058).

Henry II. (1519-59), king of France, born at St. Germain-en-Laye, succeeded his father, Francis I., in 1547. His wife was Catherine de' Medici. His principal advisers were the Guises, and he greatly oppressed his Protestant subjects. His first war was with England, to help his Scottish allies, in which he recovered (1550) Boulogne from the English. He was equally successful against the Emperor Charles V., and seized Metz, Toul, and Verdun; and though Montmorency was badly beaten at St. Quentin (1557), Calais was recovered (1558). In July 1559 Henry II. died in Paris, from a wound received at a tournament at Cateau Cambresis after the signing of the treaty of that name. See Barre-Duparcq's *Histoire de Henri II.* (1887).

Henry III. (1551-89), king of France, the third son of Henry II. and Catherine de' Medici, born at Fontainebleau, succeeded to the French throne in 1575, on the death of his brother, Charles IX. In 1573 he had been elected king of Poland. Civil war between the Huguenots and Catho-

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lic occupied most of his reign. The Roman Catholic party of the Guises tyrannized over the king; Paris grew more and more independent. Henry at first adopted the policy of the (Roman Catholic) Holy League, formed in 1576; but its contempt of the royal power led him to have Guise assassinated (Dec. 23, 1588). Paris then rose against Henry, who united with his Protestant rival, Henry of Navarre. The capital was besieged, but was saved by Henry's assassination by Jacques Clément. See M. W. Freer's *Henry III.* (1858), and Robiquet's *Paris et la Ligue sous Henri III.* (1886).

Henry IV. (1553-1610), king of France and Navarre, third son of Antoine de Bourbon, Duke of Vendôme, and Jeanne d'Albret of Navarre and Béarn, was born in the castle of Pau, Béarn. He became king of Navarre in 1562. A nephew of Condé, he fought on the Protestant side at Jarnac, and after the peace of St. Germain (1570) married Marguerite of Valois, sister of Charles IX. of France. One result of the massacre of St. Bartholomew was that Henry was forced to accept Romanism, and was detained at the French court. But in 1576 he escaped, again adopted Protestantism, and resumed his command of the Huguenot army. On the death of Henry III. Henry of Navarre became (1589) the lawful king of France. Nevertheless, from 1589 to 1595 Henry was compelled to fight the League, which was aided by Philip II. of Spain. Mayenne, the League leader, was defeated at Arques (September 1589), and at Ivry (March 1590). Henry, by once more changing his faith, was, on March 21, 1594, able to enter Paris. He then waged successful war against Spain, and suppressed the League. In 1598 Henry granted to the Huguenots the Edict of Nantes. The wars had left France in an exhausted condition, and Henry's great minister, Sully, did much to restore its prosperity. He imposed new taxes, he enforced economy, he encouraged agriculture, while Henry introduced the silk industry into France. In 1600 he defeated the Duke of Savoy. Till the end of his life Henry did all he could to check the growth of the power of the Hapsburgs. On April 14, 1610, Henry was assassinated at Paris by Ravaillac. See Poirson's *Histoire de Henri IV.* (3 vols. 1856), H. W. Baird's *The Huguenots and Henry of Navarre* (1886), Willert's *Henry IV.* (1893), and Lady C. C. Jackson's *The First of the Bourbons* (2 vols. 1890).

Henry V. of France. See CHAMBOARD, COMTE DE.



*Henry VIII. and Cardinal Wolsey. From the picture 'Ego et Rex Meus,' by Sir John Gilbert.
(By permission of the Corporation of London.)*

Henry II.

Henry II. (1333-79), king of Castile, natural son of Alfonso IX., better known as Henry of Trastamare, was defeated by the Black Prince at Najera in 1367, when trying to recover the throne from Peter the Cruel; but he won it by the battle of Montiel (1369), after which Peter was killed.

Henry III. (1379-1406), king of Castile, grandson of Henry II., reigned from 1390. He lessened the power of the nobles, and maintained order in his kingdom. He married Catherine of Lancaster.

Henry I., German emperor (919-936), born about 876, was Duke of Saxony, usually known as Henry the Fowler, and succeeded the Emperor Conrad I. After subduing various Slav tribes in N. Germany (927-928), and exacting tribute from the Duke of the Bohemians (929), he repelled a strong invasion of the Hungarians (933), and made his power felt in Denmark (Schleswig).

Henry II., German emperor (1002-24), great-grandson of Henry I., was born in 973. He was Duke of Bavaria when he was chosen to succeed Otto III. In 1004 he became king of Italy, and in 1014 was crowned emperor at Rome. For sixteen years (1002-18) he warred against the Duke of Poland, who had seized Bohemia and Silesia. Though Henry compelled him to yield Bohemia and Meissen, the duke maintained an independent attitude, and after Henry's death became king of Poland. Henry also had a long and severe struggle with Arduin, margrave of Ivrea in Italy, and found it a difficult task to curb the German nobles at home. He died at Bamberg. See Cohn's *Kaiser Heinrich II.* (1867), and Giesebrecht's *Geschichte der deutschen Kaiserzeit* (4th ed. 1874-95).

Henry III., German emperor (1039-56), the son of the Emperor Conrad II., was born in 1017. He forced the Duke of Bohemia to recognize his suzerainty (1039-42), and established his nominee, Peter, on the throne of Hungary (1042-7), but was unable to impose his power upon Andrew, Peter's successor, as also upon the dukes of Lorraine and Flanders. He was a zealous supporter of clerical power, and greatly fostered learning. It was he who built the cathedrals at Worms, Spire, and Mainz. Four successive popes (Clement II., Damasus II., Leo IX., and Victor II.) owed their election to his influence. See Steindorff's *Jahrbücher des deutschen Reichs unter Heinrich III.* (1874-81).

Henry IV., German emperor (1056-1106), son of Henry III., was born in 1050, and ascended the

throne under the regency of his mother, Agnes of Poitou; but in 1062 Hanno, archbishop of Cologne, seized the king and governed the empire in his name. Adalbert, archbishop of Bremen, however, soon rescued Henry from Hanno's hands, and declared him to be of age (1065). In 1070, however, he finally shook off the tutelage of the princes, and proceeded to curb the power of the great princes (e.g. Bavaria, Saxony, Swabia, and Carinthia), and in 1073-5 he brought the recalcitrant Saxons to their knees. But the severest struggle of his reign was against the energetic and ambitious Pope Gregory VII. (Hildebrand), who in 1076 excommunicated Henry; and it was only by personally humiliating himself, in sackcloth and barefoot, for three days, outside the castle of Canossa (January 1077) in Italy, that the emperor was able to get the papal ban removed. Meanwhile the German princes elected a successor to Henry in Rudolf of Swabia; but Rudolf fell in battle (1080), and the emperor, in spite of a second ban of excommunication, not only set up a rival Pope (Clement III.), but marched into Italy, punished the Countess Matilda of Tuscany, one of the principal supporters of Gregory VII., took Rome (1084), and had himself crowned emperor in that city by Clement III. In Germany the princes chose Hermann of Luxemburg as German king; but after his return home (1085), Henry, chiefly with the powerful assistance of Frederick of Staufen, Duke of Swabia, gradually beat down all opponents. But from 1093 to the end of his reign he was engaged in renewed strife, first against the successors of Gregory VII., and secondly against the hostile princes in Germany, who won over to their side Henry's own sons, Conrad and Henry, the latter of whom actually took his father prisoner and forced him to abdicate at Ingelheim (1105). See Floto's *Heinrich IV.* (1855-7), and Giesebrecht's *Geschichte der deutschen Kaiserzeit* (4th ed. 1874-95).

Henry V., German emperor (1106-25), son of Henry IV., was born in 1081. Although he had gained the crown with the help of the papal party, Henry nevertheless continued the struggle, as to the right to grant investiture, with Pope Paschal II., whom he took prisoner in Rome (1111). In the following year the Synod of Vienne excommunicated the emperor, and the ban was not removed until the investiture dispute was definitely settled by the Concordat of Worms (1122), the Pope securing the right to nominate the great

ecclesiastics, and the emperor the right to grant them investiture of their temporal possessions. See Gervais's *Geschichte Deutschlands unter Heinrich V.* (1841), and Giesebrecht's *Geschichte der deutschen Kaiserzeit* (4th ed. 1874-95).

Henry VI., German emperor (1190-7), was born in 1165, the son of Frederick I., Barbarossa, and Constance, heiress to the kingdom of Sicily. One of the main objects of his policy was to make himself master of that island, but he encountered fierce opposition (1191-4). Another was to abolish the elective character of the imperial sovereignty, and have it declared hereditary in his own family—a project which failed owing to the antagonism of the princes (1196). In 1193 Richard I. of England was delivered into his power by the Duke of Austria, and was only liberated for a large ransom in 1194. Henry died in Sicily. See Toeche's *Kaiser Heinrich VI.* (1867), and Giesebrecht's *Geschichte der deutschen Kaiserzeit* (4th ed. 1874-95).

Henry VII., German emperor (1308-13), son of the Count of Luxemburg, was born in 1269. On the death of Albert I., the electors chose (1308) Henry, Count of Luxemburg, as German king, and in 1309 he became German emperor. He died in Italy, whither he had gone to establish the imperial authority, disputed by the Pope, and by the Anjou dynasty in Naples.

Henry, PRINCE OF PRUSSIA, (1226-1802), born at Berlin, the brother of Frederick the Great, who described him as the only general who made no mistakes during the Seven Years' war. The victory of Rossbach (1757) was mainly due to him, and he also won the battle of Freiberg (1762), which terminated the war. He was much attached to France, was opposed to the campaign of Prussia against the revolution, and helped to bring about the peace of Basel (1795). See *Life*, in German, by Crousaz (1877).

Henry THE LION (1129-95), Duke of Saxony and Bavaria, was the son of Duke Henry the Proud, and the cousin of the Emperor Frederick Barbarossa. He married Matilda, daughter of Henry II. of England. Henry founded Munich, and encouraged the development of Hamburg, Lübeck, and other towns. In 1175 he acted disloyally toward the emperor, who in 1180 put him to the ban of the empire, and declared his lands forfeited. In 1181 he submitted, and was permitted to keep Lüneburg and Brunswick. He then spent three years in England. See M. Philippson's *Geschichte Heinrichs des Löwen* (1867-8).

Henry THE NAVIGATOR (1394-1460), Portuguese prince, son of John I., King of Portugal, and of Philippa, sister of Henry IV. of England. After showing conspicuous courage at the siege of Ceuta in 1415, he devoted himself to the development of navigation and the fostering of maritime expeditions. His first voyage, in 1418, was unsuccessful, though three of his vessels reached Madeira. By 1440 Cape Blanco was reached, Cape Verde in 1446, and the Azores in 1448. The colonization of the Azores occupied much of his thoughts. He built an observatory and a school of discovery at Sagres, near Cape St. Vincent. See Major's *Discoveries of Prince Henry the Navigator* (1877), and Beazley's *Henry the Navigator* (1895).

Henry of HUNTINGDON (?1084-1155), English historian, born in East Anglia; became archdeacon of Huntingdon. He commenced the *Historia Anglorum* (first published in 1596).

Henry of LANCASTER, FIRST DUKE OF LANCASTER (?1299-1361), son of Henry, Earl of Lancaster (?1281-1345), in early life was a crusader, and also served in the Scottish wars of 1333 and 1336. Created Earl of Derby (1337), he succeeded his father as High Steward of England. With Edward III. he distinguished himself in France (1345-46), and on his return to England was one of the original knights or founders of the order of the Garter. In 1351 he was created Duke of Lancaster. His daughter Blanche married John of Gaunt, and became the ancestress of the House of Lancaster.

Henry, GEORGE, Scottish painter of the Glasgow school; began life as an illustrator; painted, in the Highlands, the *Glasgow Men* (1881), and exhibited in 1882. In conjunction with E. A. Hornel, he painted *The Druids* (1890), and visited Japan with him in 1893. Since 1895 he has devoted himself to portrait painting. His works are decorative in quality, and follow nature closely. See *The Glasgow School of Painting*, by David Martin (new ed. 1902).

Henry, JOSEPH (1799-1878), American scientist, born at Albany, New York; was appointed professor of mathematics at Albany Academy (1826), natural philosophy professor at Princeton (1832), and first secretary of the Smithsonian Institute (1846). He greatly promoted the study of electricity and the application of electro-magnetic apparatus, and carried on researches in terrestrial magnetism, acoustics, and meteorology. He had a controversy with Morse as to which

of them was the inventor of the electric telegraph. (See TELEGRAPHY.) He was president of the National Academy of Sciences (1838-78), chairman of the National Lighthouse Board (1871-8). He died at Washington. See *Smithsonian Miscellaneous Collection* (vols. xx., xxi., and xxx.) for papers and biography.

Henry, MATTHEW (1662-1714), Welsh nonconformist divine and commentator, born at Broad Oak, Flintshire; in 1687 he became a Presbyterian minister at Chester, whence he removed to Hackney, London, in 1712. His principal work was an *Exposition of the Old and New Testament*, completed by others in 1811, and still valued for its devotional tone and practical application.

Henry, PATRICK (1736-99), American statesman and orator, born in Hanover co., Virginia, of Scottish descent; first distinguished himself as an orator against unjust taxation (1763). His speeches against the Stamp Act placed him in the front rank of the revolutionary party; and as delegate to the first Continental Congress at Philadelphia (1774) he delivered the opening oration, a triumph of fiery eloquence. Having carried the Virginian vote for independence (1776), he was elected governor of his native state (1776-9, 1784-86). In 1791 he retired, and resumed his practice of law. The greatest of American orators, save Webster, Henry was at the same time an able and far-seeing statesman. See William Wirt's *Sketches of the Life of Patrick Henry* (2nd ed. 1818); Tyler's *Patrick Henry* (1887); and W. W. Henry's *Patrick Henry* (1891).

Henry, ROBERT (1718-90), Scottish historian and divine, born at St. Ninians, Stirlingshire; transferred (1776) from New to Old Greyfriars' Church, Edinburgh, in charge of which he died. His popular *History of England* (vols. i.-v., 1785; vol. vi. ed. by Laing, 1793) comes down to the reign of Henry VIII. See *Life in M. Laing's edition of his Works* (1788).

Henry, WILLIAM (1774-1836), English chemist and physician, was born at Manchester; discovered the law of solubility of gases, known as 'Henry's law'; wrote *Elements of Experimental Chemistry* (11th ed. 1829), remarkable for accuracy in facts and literary elegance. He was Copley medallist of the Royal Society in 1808.

Henryson, ROBERT (?1430-1506?), Scottish poet, apparently a native of Fife. In all likelihood he was in priest's orders, and he may have been master of the grammar school of Dunfermline. His long allegorical poem, *Orpheus and Eurydice*,

and the ballad on *The Want of Wise Men*, were printed in 1508; the *Moral Fables* in 1570; and *The Testament of Cressid*, included in an edition of Chaucer's *Works* (1532), was published separately in 1593. But the only critical edition is *The Poems and Fables of Robert Henryson*, ed. by David Laing (1865). Contemplative and descriptive rather than lyrical, he had a very intimate sympathy for nature, and is at his best in describing the scenes and characteristics of rural life. His most unique and perfect performance is perhaps the delightfully naive *Robene and Makeyne*, a humorous tale of rustic courtship. Among his graver pieces mention may be made of *The Abbey Walk* and *The Praise of Age*. His more characteristic qualities are perhaps best manifested in his *Moral Fables* (paraphrased from *Aesop*). See *Life in Laing's ed.* (1865); *Byre-Todd's Medieval Scottish Poetry—Robert Henryson* (1892); T. F. Henderson's *Scottish Vernacular Literature* (1898); and Millar's *Literary History of Scotland* (1903).

Henry the Minstrel, or **BLIND HARRY** (fl. 1450-92), the supposed author of an epic poem on Sir William Wallace, obtained his livelihood by recitation of poetic stories about Wallace. He died some time between 1492 and 1506. His name of 'Blind Harry' occurs in Dunbar's famous *Lament for the Makaris* (1508). According to Major, *The Whole Book of William Wallace* was composed about 1450-60. In 1820 it was edited by Dr. Jamieson, and in 1884-9 by Mr. James Moir for the Scottish Text Society. A modernized version by William Hamilton of Gilbertfield (1722) attained remarkable popularity among the peasantry of Scotland. His poem is characterized not only by much rude eloquence, but by great facility of versification; and there is clear evidence of familiarity with Chaucer. On this and other grounds, Mr. J. T. T. Brown, in *The Wallace and the Bruce Redivided* (1900), broached the opinion that the *Wallace* was practically the work of the contemporary transcriber, John Ramsay, who merely used the recitations of Harry as the groundwork for a connected poem; but the external evidence is all against the probability of such a theory. See T. F. Henderson's *Scottish Vernacular Literature* (1898), and Millar's *Literary History of Scotland* (1903).

Henschel, GEORG (1850), German baritone singer, composer, and conductor, born at Breslau. After singing with great success at Brussels (1873) and Cologne (1874), he won an even greater

success in London in 1877, and settled there about 1885, succeeding Jenny Lind at the Royal College (1886-8). He acquired a great reputation as a teacher of singing. His compositions include songs, vocal studies, a *Requiem*, *Mass*, *Stabat Mater* (1899), *Te Deum*, an opera *Nubia* (1899), and a comic opera (1899). He has also published *Personal Recollections of Johannes Brahms*. His wife, Lilian Bailey (1860-1901), was a noted American soprano.

Henselt, ADOLF VON (1814-89), German musical composer, born at Schwabach in Bavaria; became court pianist and teacher to the imperial children in St. Petersburg, and subsequently inspector of music at the Imperial School for Girls. Henselt was a master of the keyboard, his method being a link between those of Hummel and Liszt. He is chiefly known by his scholarly arrangements of Weber's works.

Henslow, JOHN STEVENS (1796-1861), English botanist, born at Rochester, Kent; professor of mineralogy at Cambridge (1822-27), and subsequently of botany (1827-61). Darwin was one of his pupils. His books include *Catalogue of British Plants* (1829), and *Dictionary of Botanical Terms* (1857).

Henslowe, PHILIP (d. 1616), English theatrical manager, who owned or had a share in various London theatres between 1587 and 1616. Alleyn, the actor, married his step-daughter. His *MS. Diary*, discovered at Dulwich College about 1790, contains important matter upon the stage, actors, and plays of the period. Amongst others, Chapman, Dekker, and Chettle wrote plays for him.

Henty, GEORGE ALFRED (1832-1902), English author, born at Trumpington, near Cambridge; went to the Crimea (1854), was purveyor to the forces, organized the hospitals of the Italian Legion, and acted as special correspondent of the *Standard*; witnessed the Italo-Austrian war (1859); was with Garibaldi in the Tyrol (1860); accompanied the then Prince of Wales to India (1876); and was through the Franco-Prussian (1870-1) and Turko-Servian (1876) wars. He wrote over seventy books for boys — e.g. *A Search for a Secret*; *Out on the Pampas* (1871); *Young Franc-tireurs* (1872); *Dorothy's Double* (1894); *The Queen's Cup* (1897); *Colonel Thorndyke's Secret* (1898).

Henzada, chief tn. in dist. of same name, Pegu div., British Burma, lies on the r. bk. of the Irawadi. 68 m. N.W. of Pegu. Pop. (1901) 24,756. The district has an area of 2,886 sq. m., and a pop. (1901) of 484,558.

Hepatica, a name given to certain ranunculaceous plants, sometimes regarded as constituting a separate genus, sometimes as belonging to the genus *Anemone*. They are all hardy, of low growth, preferring shade, a moderate degree of moisture, and to be left undisturbed. They flower in early spring, the flowers resembling a buttercup in form, but in colour varying through shades of white, blue, and red. The leaves have from three to five lobes, and often persist through the winter. *H. angulosa* is perhaps the most valuable species.

Hepaticæ. See LIVERWORTS. **Hephæstion**, a favourite of Alexander the Great; commander of the body-guards. In 325 B.C. he died of a fever at Ecbatana, after an illness of only seven days, and Alexander gave him a magnificent funeral.

Hephæstus, identified by the Romans with their god Vulcan, was in Greek mythology the god of fire, and of all the arts, especially the working of metals which depend on the use of fire. He was the son of Zeus and Hera. He was lame from birth and weak, so that he was the laughing-stock of the other gods, and so disliked by Hera that she threw him down from heaven. He made the armour of Achilles, the fire-breathing bulls of Ætes, and other wonders. Lemnos was his favourite place on earth; but other volcanic islands—Lipara, Imbros, and Sicily—are particularly associated with him. In the *Odyssey* his wife is Aphrodite, who betrayed him for Ares; but Hephæstus ensnared the guilty pair in an invisible but indissoluble net, and showed them to the other gods.

Heppenheim, tn. and health resort, grand-duchy of Hesse-Darmstadt, Germany, 21 m. S. of Darmstadt. Here are the ruins of the castle of Starkenburg (1064). Tobacco and vines are grown, and in the vicinity are stone quarries. Pop. (1900) 5,779.

Heptarchy, the name generally applied to the supposed seven (hence the name) kingdoms into which Saxon England was divided. To suppose that there were at any time exactly seven kingdoms is an error. The term played some part in the Home Rule controversy as a description of the alleged 'separatist' tendencies of Mr. Gladstone's measure.

Hera, called Juno by the Romans, was in Greek mythology the wife and sister of Zeus. Homer represents her as of a jealous, quarrelsome, and obstinate disposition; she pursues with unrelenting hatred the mistresses of Zeus and their children, especially Hercules and Dionysus. She even plots with Poseidon and Athena to put Zeus

in fetters, and is beaten and otherwise punished by him. She bore to him Ares, Hephæstus, and Hebe. She was the patroness of marriage and childbirth. In legend she is conspicuous especially for her aid to the Greeks against the Trojans, against whom she was embittered because Paris in his famous judgment pronounced her beauty inferior to that of Aphrodite. She was worshipped throughout Greece, but above all at Olympia, Samos, and Argos. She is represented in art as a woman of majestic beauty, with large eyes—Homer often calls her 'ox-eyed'—and a noble expression.

Heracleia, the name of several ancient Greek towns. (1.) **HERACLEIA IN LUCANIA**, in S. Italy, on the N.W. coast of the Tarentine Gulf; was founded, probably in 432 B.C., by Tarentum and Thurii jointly, on the site of the former town of Siris. It became the meeting-place of the general assembly of the Italiot Greeks. Near Heracleia, in 280 B.C., Pyrrhus defeated the Romans; but two years afterwards the town joined the Romans. It disappeared during the middle ages. Near it was found the *Tabule Heracleenses*, bronze tablets inscribed with its municipal regulations, according to Julius Caesar's municipal law of 45 B.C. (2.) **HERACLEIA**, called **MINOA**, a Greek colony on the S. coast of Sicily, between Selinus and Agrigentum. Minoa, a small colony from Selinus, was seized by Euryleon of Sparta, who changed its name to Heracleia. In the first Punic war it was one of the chief naval stations of the Carthaginians. Ptolemy is the last writer to mention it. (3.) **HERACLEIA PONTICA** (now Ereğli), in Bithynia in Asia Minor, was a colony from Megara; people of Tanagra in Boeotia also shared its foundation. In the Roman wars against Mithridates it was plundered and partly destroyed by Aurelius Cotta.

Heracles. See **HERCULES**.

Heraclian is first mentioned in 408 A.D. as having with his own hand killed Stilicho. He was rewarded by being appointed count of Africa, where he did Honorius good service during the invasion of Alaric and the usurpation of Attalus. Early in 412 he proclaimed himself emperor, and invaded Italy, but was defeated and afterwards slain. Kingsley introduces him into *Hyperion*.

Heracleidæ, the sons of Heracles, who according to Greek tradition were expelled from Argos by Eurystheus, and took refuge at Athens. After some time they invaded the Peloponnesus, but were forced to agree to abstain from invading the land for the next fifty years. At the ex-

piration of that time the descendants of Heracles successfully invaded the Peloponnese, and established the kingdoms of Argos, Sparta, and Messenia. The traditional date of this event is about 1050 B.C. Euripides's play *The Heraclidae* deals with their reception at Athens.

Heraclitus of Ephesus (c. 576-c. 480 B.C.), early Greek philosopher of the Ionian school. His chief theories were that fire, or rather heat, is the cause and inherent principle of all existence, and that everything in the world is in a state of flux or motion (*πάντα ῥεῖ*). Zeller calls him 'the first philosopher who emphatically proclaimed the absolute life of nature, the ceaseless change of matter, the variability and transitoriness of everything individual; and, on the other hand, the unchangeable equality of general relations, the thought of an unconditioned, rational law governing the whole course of nature' (vol. ii. p. 105 of Eng. trans. 1881). Heraclitus was known as 'the weeping philosopher,' in contradistinction to the laughing Democritus, because of his laments over the folly of mankind. His *Fragmenta* were edited by Bywater (1877). See F. Lassalle's *Die Philosophie Heraklits des Dunkeln* (2 vols. 1858), and Patin's *Heraclitus Einheitslehre* (1885).

Heraclius, emperor (610-641) of Byzantium, was born in Cappadocia about 575. After defeating and slaying Phocas, he raised himself to the throne. The barbarian Avars threatened him from the Danube, and Persia, on the east, stripped the empire first of Syria and the Holy City, then of Egypt, and finally of Asia Minor up to the Bosphorus. At length Heraclius disposed of the Avars (620), partly by display of force, partly by the usual Byzantine bribery, and then turned against the Persians. Jerusalem and Syria were reconquered. In a series of campaigns he rolled back the tide of the Persian invasion, recovering the true cross, and thus made the task of Mohammed so much the easier. Against the Arab invasion and conquest of Syria and Egypt he did nothing. Egypt he had already alienated by religious persecutions. See Draperyon's *L'Empereur Héraclius* (1869).

Heraeum, the temple of Hera in Argolis, about 6 m. N. of Argos. It was burned to the ground in 427 B.C., and rebuilt with great magnificence. Polycleitus, the sculptor, enriched it with a colossal statue of Hera. The site was excavated by the American school in Athens between 1892 and 1895, the results being published in the *American Archaeological Journal*.

Herald, an officer of state whose duties formerly comprised the regulation of armorial bearings, the ordering of tournaments, trials by combat, the arrangement of state ceremonies, processions, etc., and the bearing of royal messages. In modern times his principal functions are the

own, and that these have been transmitted with little or no change to the present day.

Shape of Shield.—Tombs and seals are the relics of antiquity upon which we find the earliest examples of arms. The earlier forms of shields are drawn in Fig. 1, but there are now many others.

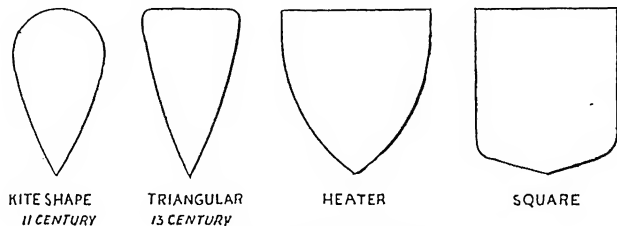


FIG. 1.—Forms of Shields.

devising and granting (under the sovereign) of coats-of-arms, the authentication of pedigrees, making royal proclamations, and taking part in the pageantry of coronations, etc. In England the heraldic establishment is called the *Heralds' College*, or *College of Arms*, and comprises three kings-of-arms, named respectively Garter, Clarenceux, and Norroy; six heralds—Chester, Lancaster, York, Somerset, Richmond, and Windsor; and four pursuivants (novitiates)—Rouge Croix, Blue Mantle, Rouge Dragon, and Portcullis. The supreme head of the English heralds is the Earl Marshal—a hereditary office of the Dukes of Norfolk. There is also a fourth king-of-arms, styled Bath, attached to the order of the Bath, whose jurisdiction is the principality of Wales. He is not, however, a member of the *Heralds' College*.

Scottish heraldry is presided over by the Lord Lyon King-of-Arms, whose establishment is called the Court of the Lord Lyon, or Lyon Office. There are three heralds—Albany, Ross, and Rothesay; and three pursuivants—Carrick, March, and Unicorn. There were formerly six of each.

In Ireland there are the Ulster King-of-Arms; two heralds—Cork and Dublin; and two pursuivants—Athlone and St. Patrick.

The herald's official habit is the tabard or surcoat embroidered with the royal arms and a collar of ss. The kings-of-arms have crowns of gold adorned with sixteen upright oak-leaves.

Heraldry. For popular purposes, the words *armoury* and *heraldry* may be considered as identical. Disregarding speculations as to the origin of the science, it will suffice to say that in the 13th century heraldry was, in Britain, in possession of a system and nomenclature of its

Rules of Blazon.—The surface of the shield is termed the field, and may be of one or more colours. That which is borne on the shield is called the charge, and the field and charge together form the coat-of-arms. The coat-of-arms, with its exterior ornaments, including the supporters, the helmet, the livery colours, the crest, mantle, and mantling, is termed the achievement. To describe a shield and the bearings upon it, with their positions and colours, in concise and unambiguous technical language, so that it may be possible to reproduce the same accurately from the description, is to blazon the coat. In heraldry the written word is the law. In blazoning begin with the field, then proceed to the charge of most importance, or the one which occupies the centre of the shield. Should the charge be an ordinary, and it be itself charged with figures, these are next mentioned; then the other charges on the shield, a chief bordure or canton being always mentioned last. Beginners will find it a good rule to write out the names of the tinctures in full. Punctuation is sometimes a difficulty; there ought to be a comma after each colour, as in this example—'Gules, three lions passant guardant in pale or.' Almost the only exception to this rule is where the field is composed of alternate colours—e.g. 'Barry of six argent and azure, in chief three torteaux gules;' here the comma occurs only after the second colour.

Metals, Colours, and Furs.—These, with their corresponding tinctures, are shown in the table and illustration given below (Fig. 2). Metal is not to be placed upon metal, colour upon colour, or fur upon fur. An exception to this rule occurs where charges, animate or inanimate, are of the natural colours of the animals or things

they represent; then they are described as proper, and two charges of metal or colour, even of the same metal and the same

hand side of the shield opposite the right of the spectator. For convenience of blazon the shield is divided into nine points (Fig. 4).

ures in heraldry most frequently in use. They have been so subdivided for purely fanciful reasons, and no two authorities agree as to the exact classification. But for practical purposes they have since Nisbet's time been adopted as the basis of all text-books on the subject. The eight honourable ordinaries and their positions are most easily explained by illustration. (See Fig. 3.) The subordinaries most usually met with (Fig. 3) are (1) the pallet,

Metals.	Tincture.	Represented by.
Gold.	Or.	Dots irregularly disposed.
Silver.	Argent.	Shield a blank.
Colours.	Tincture.	Represented by.
Blue.	Azure.	Horizontal lines.
Red.	Gules.	Perpendicular lines.
Black.	Sable.	Perpendicular and horizontal lines crossing each other.
Green.	Vert.	Diagonal lines from right to left.
Purple.	Purple.	Diagonal lines from left to right.
Tenné.	Orange.	Lines in bend sinister crossed by others bar ways.
Sanguine.	Blood-colour.	Lines in saltire.
Furs.	Tincture	
Ermine.	White, powdered with black spots.	
Ermines.	Black, with white spots.	
Peau.	Black, with gold spots.	
Erminois.	Gold, with black spots.	
Vair.	Rows of small escutcheons coloured (generally) alternately azure and argent.	

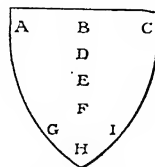


FIG. 2.—Points of the Shield.

A, The dexter chief; B, the middle chief; C, the sinister chief; D, collar or honour point; E, the fess point; F, the navel point; G, the dexter base; H, the middle base; I, the sinister base.

colour, may be found in juxtaposition, separated only by outline.

Points of the Shield.—The shield has a dexter and sinister side, so called from their position

Partition Lines.—These lines, otherwise termed dividing or border lines, are distinguished according to their form. The straight lines are perpendicular,

the diminutive of the pale, and extending to one-half its breadth; the pile is a form of the pale,

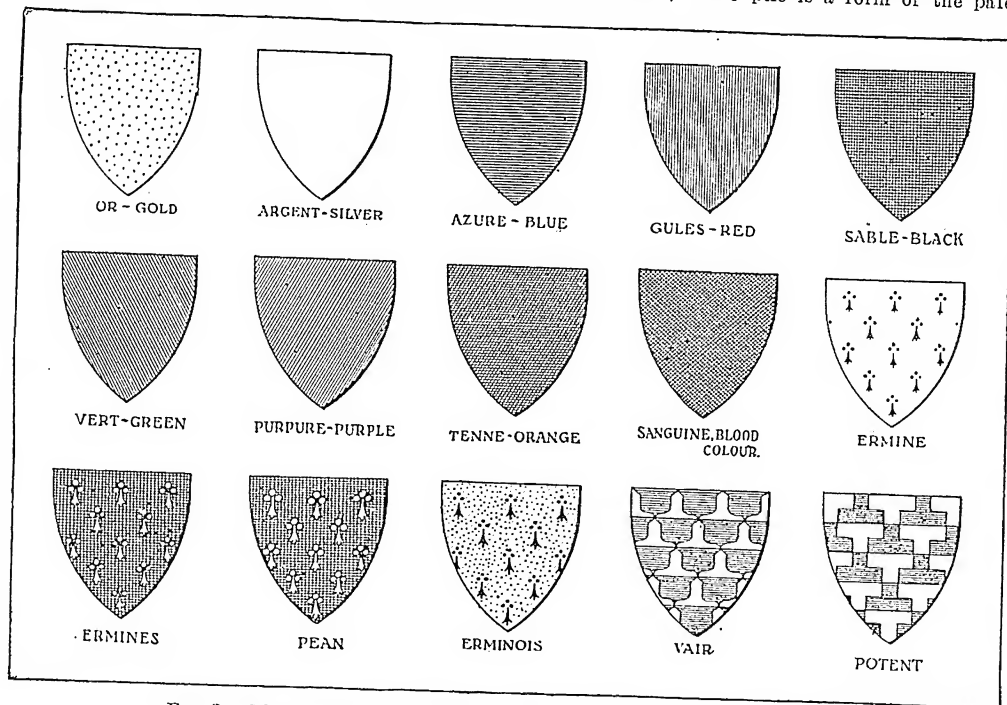


FIG. 2.—Metals, Colours, and Furs, with their corresponding Tinctures.

in relation to the imaginary bearer. It follows that the dexter or right-hand side of the shield is opposite the left hand of the spectator, and the sinister or left-

horizontal, or diagonal. The other lines are chiefly those shown in Fig. 5.

Ordinaries and Subordinaries.—These are the conventional fig-

sharpened at the lower end where it approaches the base of the shield; (2) the bar (one-half of the fess), the closet (one-half of the bar), and the barrulet (one-

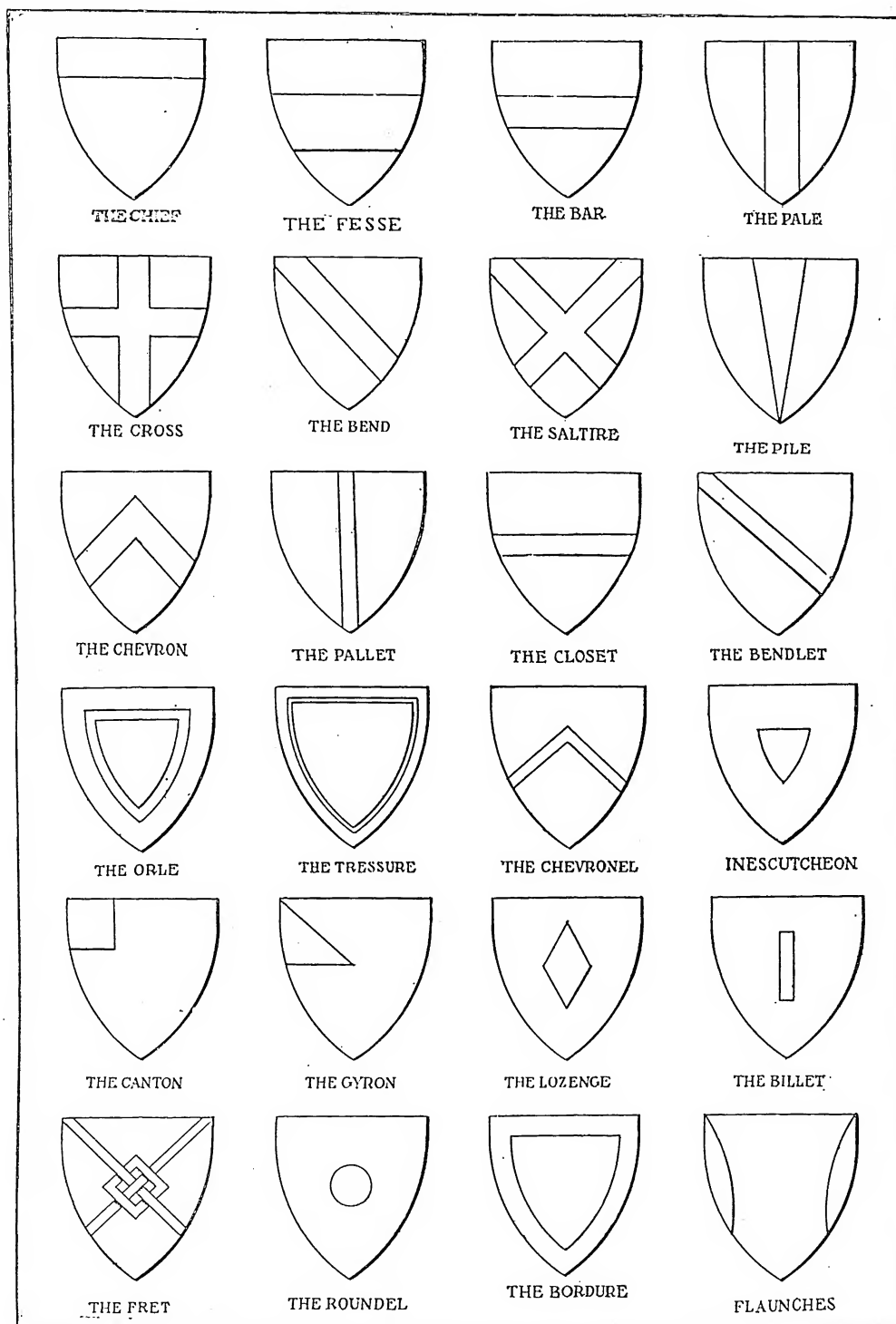


Fig. 3.—The Honourable Ordinaries and Subordinaries,

half of the closet); (3) the bendlet (one-half of the bend), and the ribbon cotise or cost (one-half of the bendlet); (4) the orle a bordure, detached from the sides of the shield; (5) the tressure in the form of an orle, usually enriched by fleurs-de-lis and blazoned a tressure flory (where the flowers are disposed alternately, it is a tressure flory counter-flory; and where the tressure is doubled, as in the arms of Scotland, the blazon is, or, a lion rampant within a double tressure flory counter-flory gules); (6) the chevronel (one-half of the chevron), and the coupleclose (one-half of the chevronel, and always borne double); (7) the inescutcheon, a small shield borne within the shield, usually in fess point; (8) the canton, occupying the dexter chief, and when occupying a corresponding position on the other side of the shield, blazoned a canton sinister; (9) the gyron, a triangular figure unknown as a separate charge in British her-

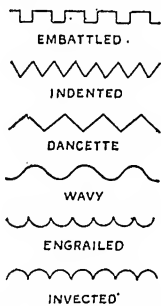


FIG. 5.—Partition Lines.

aldry, but familiar by the Campbell arms, composed of eight gyrons, blazoned gyronny of eight or and sable; (10) the lozenge, a diamond-shaped figure—the mascle is a lozenge voided of the field, the rustre is a lozenge pierced with a circle, and the fusil is an elongated lozenge; (11) the billet, an elongated rectangular figure; (12) the fret, a saltire interlaced with a mascle; (13) roundle is the generic name given to a series of small discs, each named according to its tincture, as, the bezant or, the plate argent, the torteau gules, the hurt azure, the pellet sable, etc.

Charges on Shields.—These are conveniently divided into animate and inanimate. The former class includes (1) the fabled monsters of heraldry; (2) man and his parts; (3) all other divisions of the animal kingdom. (1.) *Monsters.* Monsters are really of infrequent occurrence in British coats. The griffin, half-eagle and half-lion, with huge ears, a combination supposed to represent wisdom and fortitude, is represented

either as rampant, passant, or salient. The dragon, a winged monster with a griffin's head, a body with four legs, huge claws, and barbed tongue and tail; the wyvern, a two-legged dragon; the cockatrice, a wyvern with the head of a cock, are all occasionally met with. The unicorn, with the body of a horse, the beard of a goat, a long spiral horn springing from the middle of the forehead, and cloven hoofs, is familiar as one of the royal supporters. (2.) *Man.* The old ecclesiastical seals furnish us with numerous examples of saints. To step lower, the blazon of Dalziel is, sable, a naked man proper. As allusive, or, as they are termed by the vulgar, canting arms, Moors' heads are carried by the Mores and Morisons. The eye, the arm, and the leg have all been pressed into service. The arms of the Isle of Man—gules, three legs in armour flexed and conjoined at the thighs proper, spurred and garnished or—is still borne by the families who once ruled the island. (3.) *Beasts.* The earliest example yet brought to light of the lions of England is on the great seal of Richard I. (1198), which gives three lions passant guardant in pale. The lion rampant appears on the great seal of Alexander II. of Scotland (1229). The lion is blazoned in various attitudes—rampant, passant, passant guardant, statant, salient, sejeant, or couchant. The poetic blazon of the house of Hepburn is, gules, on a chevron argent, two lions pulling at a rose of the field. Demi-lions, lions' heads, and jamps or paws are of frequent occurrence. The elephant, horse, boar, bear, wolf, dog, fox, deer, hare, otter, bull, sheep, and even the rabbit, appear in arms. The family of Herries carries, argent, three hedgehogs sable. (4.) *Birds.* The eagle appears as a heraldic bearing early in the 12th century. In England the examples of its use are numerous. In Scotland it is mainly carried by families of Celtic origin. Sometimes it is represented with two heads; more frequently, displayed. Demi-eagles, eagles' heads, wings, and legs also occur. The alerion is an eagle minus beak and claws. The hawk, the heron, and the crane, the raven and the cock, are of frequent occurrence. *Longo intervallo* come the papingo or parrot, the swan, the martlet, the phoenix, and some others. (5.) *Fish.* The dolphin, the device of the heir to the throne of France, is carried by many British families. The Royal Fishing Company of Scotland, in the reign of Charles II., was granted, azure, two herrings in saltire or surmounted by a crown proper. Fish as allusive arms are carried by many families

in England and Scotland. Coming lower down the scale of creation, we find serpents blazoned as gliding or nowed, tortoises, frogs, tadpoles or powets, snails, worms, ants, bees, butterflies, and spiders.

The inanimate charges are:—1. *Natural.* (a) *Astronomical.* Azure, the sun in his glory is the coat of augmentation of the marquessate of Lothian. The moon when borne full is said to be in her complement, but she is usually represented by the half-moon or crescent. When the horns point towards the chief she is blazoned a crescent, as in the arms of Seton, Oliphant, and others. When her horns point to the dexter she is increscent, and to the sinister decrecent. The mullet is a star of five points (see below, spur rowel); the star is a figure of six or more points, straight or waved, but if of more than six points or if waved, to be so blazoned. Comets, thunder-

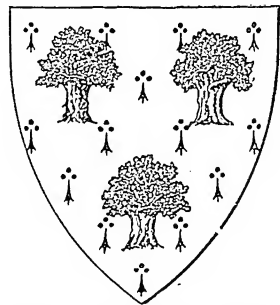


FIG. 6.—Allusive Arms (Spottiswoode).

bolts, rainbows, and clouds also occur. (b) *Terrestrial.* Include such charges as mountains, rocks, rivers, wells, and caves. (c) *The vegetable kingdom.* Trees occupy an important position in heraldry. In England the Penderells, who hid Charles II. in the oak after the battle of Worcester, were granted, argent, an oak tree proper, fructed or, surmounted by a fess sable, thereon three crowns proper. The O'Connor Don in Ireland bears, argent, an oak tree vert; and Macgregor in Scotland, argent, a fir tree growing out of a mount in base vert, surmounted of a sword in bend supporting an imperial crown proper. The oak, fir, and pine are most usually met with in our blazons. Palms also occur, and branches, leaves, and the fruits of the earth in endless variety from the pineapple downwards. Allusive arms in this department of heraldry are often met with, a striking example being those of Spottiswoode of that ilk, ermine, three oak trees fructed proper. 2. *Artificial charges* may here be

classified as they relate to military, ecclesiastical, or civil life. In the first class are comprehended castles, mural crowns, and implements of war, as swords, spears, and armour. Under this latter category comes the spur rowel (see below, mullet), which is a mullet pierced; and if of more than five points, to be so blazoned. Nautical charges include naval crowns, ships, lymphads, anchors, etc. Ecclesiastical charges embrace the crosier,

were—(1) change of tinctures, as Campbell of Loudoun, who changed his chief's coat, gyronny of eight or and sable, into gyronny of eight gules and ermine; (2) the alteration of the boundary line of an ordinary by engrailing, invecting, or indenting; (3) the increase or diminution of charges in a field; (4) the introduction of a charge from the arms of a mother or a wife; (5) a charge allusive to some exploit of the bearer; and

of Sir Walter Ogilvy of Boyne, second son of Sir Walter Ogilvy of Deskford and Findlater (1472), is an early example of the use of the crescent as the mark of cadency of a second son. The main objection to the practice of minute differencing is that in a generation or two it leads to irretrievable confusion. The scientific method of differencing, which admits of a variation much greater than the exigencies of human descent are ever likely to demand,

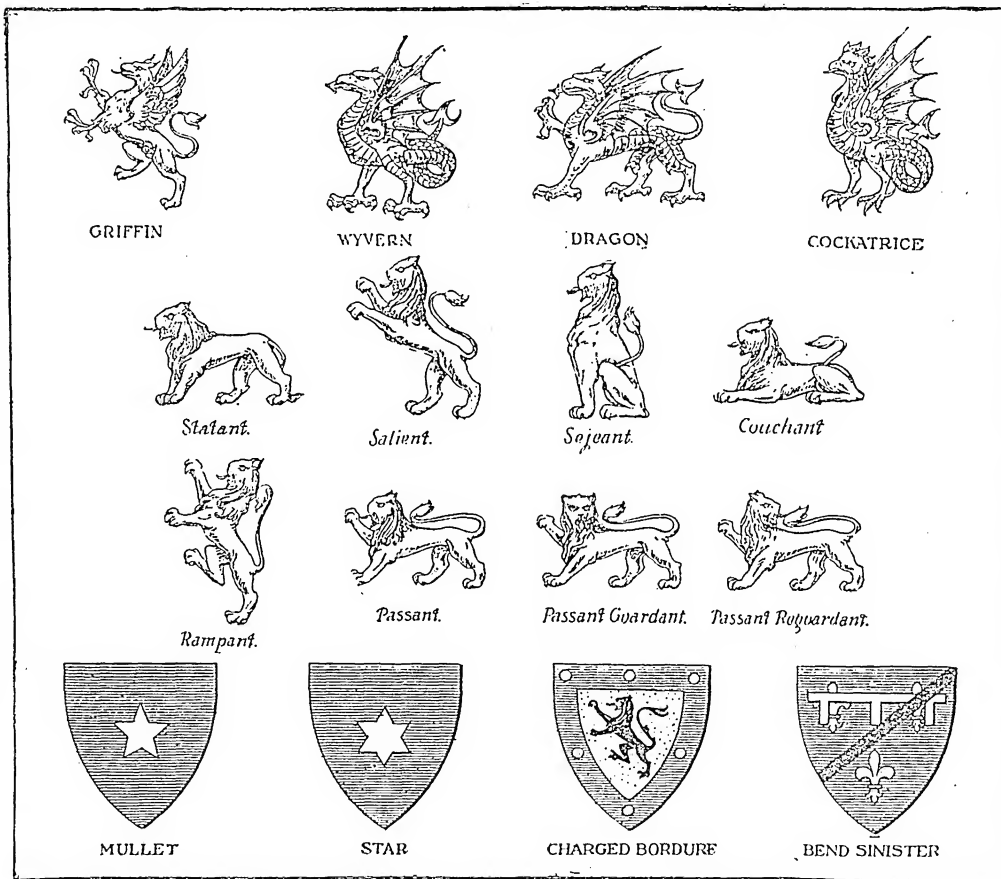


FIG. 7.—Charges on Shields.

the mitre, the keys, and similar adornments. All other charges, the representation of the handiwork of man, not strictly embraced within the two preceding classes, from the sleeve of a woman's gown, termed in heraldry a maunch, to padlocks and gridirons, come under the third class.

Cadency or Differencing.—The necessity of differencing the arms of the head of a house from those borne by its cadets became early a burning question in heraldry. The methods generally adopted

various others. In the 16th century the system of minute differencing was adopted (Fig. 8). This gave for the eldest son a label, the second a crescent, the third a mullet, the fourth a martlet, the fifth an annulet, the sixth a fleur-de-lis, the seventh a rose, the eighth a cross moline, and the ninth a double quatrefoil. The use of the label of five points is as early as the end of the 12th century. Edward I., before his accession to the throne, used a label of three points. The seal

is by the use of the bordure. Its position in the shield leaving the field untouched, the variations in outline and tincture its form permits of, and the innumerable charges which may be placed upon it, combine to make it in the hands of the skilful herald a perfect instrument for cadency purposes.

Marshalling is the arranging of two or more coats in one shield. The earliest method of displaying an alliance was by placing the arms of a husband and wife side by side in separate shields. Then

came the methods of (1) dimidiation, by which the dexter half of the husband's arms were joined to the sinister half of the wife's;



FIG. 8.—Cadency.

(2) impaling, by which the entire coats of each are impaled complete in one shield. Quartering came into use in the 13th century. Where two coats were to be quartered, the husband's were generally placed in the first and fourth quarters, and the wife's in the second and third; but in the days of pure heraldry, if the wife were of higher rank or brought the fortune, her arms had frequently the place of honour. Official arms, such as those carried by archbishops, bishops, and abbots, impaled, first, the arms of their sees or abbeys, and, second, their paternal arms (Fig. 9). The Kings of Arms in England and Ireland and the Lord Lyon in

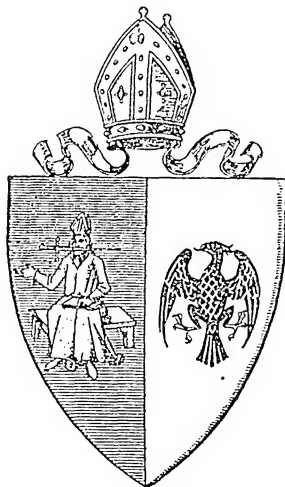


FIG. 9.—Official Arms.

(The see of Chichester impaling Wilberforce.)

Scotland also impale their official with their paternal arms.

Augmentations are additions made by the sovereign to the arms

of an individual, as a recognition of public services. Thus, Henry VIII., in respect of the encounter at Flodden Field in 1513, granted to Thomas Howard, Earl of Surrey, afterwards Duke of Norfolk, as a special mark of honour, the augmentation following, on an escutcheon or, a demi-lion rampant pierced through the mouth with an arrow within a double tressure flory counter-flory gules. And William of Orange granted to Colonel Archibald Row of the 21st Regiment, for military services in Flanders, as an addition to his paternal coat, on a canton azure, an orange stalked and slipped vert, ensigned with an imperial crown proper.

Arms of Dominion.—The most distinguished example is the coat of His Majesty King Edward VII., first and fourth England, second Scotland, third Ireland. In Scotland the blazon is first and fourth Scotland, second England, third Ireland, with the appropriate

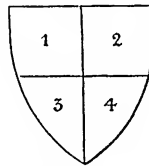


FIG. 10.—Quarters of the Shield.

differences in the supporters and other exterior ornaments of the shield.

Illegitimacy in persons descended from parents of princely rank is indicated by the bend sinister; in those of lesser rank in England and Ireland generally by the bordure wavy, and in Scotland by the bordure gobony.

Exterior Ornaments.—The origin of supporters is attributed by some writers to the tournaments, where the shields of the combatant knights were displayed guarded by pages, others to the good offices of engravers. The unicorn, one of the royal supporters, appears on Scottish seals temp. Jac. III. In England the use of supporters is limited to peers of the realm and to the knights grand crosses of the several orders. In Scotland, peers, the heirs of barons who had the right of free barony prior to 1587, chiefs of clans, and private gentlemen who can prove usage prior to 1672, are entitled to supporters. The Lyon has the right, sparingly exercised, of conferring supporters on individuals of eminent rank. One of the latest exercises of this right was in the case of Sir Walter Scott of Abbotsford. The helmet was placed above the shield, and each of the

four degrees had its appropriate form, although such distinctions are of comparatively modern origin—(1) the sovereign and

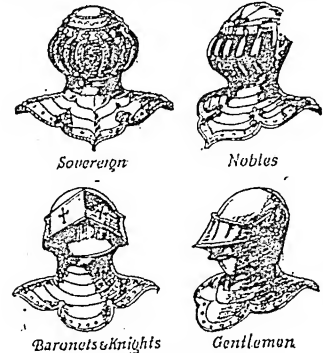


FIG. 11.—The Helmet.

princes of the blood, full faced, of gold, with six bars; (2) nobles, in profile, of silver, with five bars; (3) baronets and knights, full-faced, steel, with silver ornaments, no bars, visor raised; (4) gentlemen, in profile, steel, visor closed. In the arms of princes and peers the coronets befitting the various degrees are placed above the shield, the helmet on the coronet. The wreath or torse lies on the crest of the helmet, and consists of the livery colours, being the tinctures of the ground and of the principal charge in



FIG. 12.—Complete Armorial Bearings (Arms of the Earl of Rosebery).

1. Motto. 2. Crest. 3. Wreath. 4. Helmet. 5. Lambrequin. 6. Coronet. 7. Shield, quartered. 8. Mantle.

the shield. On the wreath is placed the crest, a fashion said to have come in with the 14th century, but it is in fact almost as

old as the use of the helmet itself. Crests ought to bear some allusion to the arms, however remote. On a scroll above the helmet is the motto, whose inward meaning is generally a puzzle to the outsider. Sometimes the motto is underneath. All mottoes have a real or fancied reference to the arms. That is why it is depraved heraldry to have more than one motto. The *lambrequin*, or mantling, is a painter's device. It is represented as attached to the helmet and flowing down either side of the shield. Its treatment varies as the idea of the draughtsman is grotesque or graceful. The *mantle* is the robe forming the background, repeating on its folds or laps the arms in the shield.

Who may bear arms.—No statutory definition of the classes who may, in England or Ireland, apply to the proper officers for a title to bear arms appears to have been issued. In Scotland, by an Act of Parliament passed in 1672, the Lord Lyon is entitled to grant arms to all virtuous and well-deserving persons; and the practice of granting coats armorial to suitable applicants is believed to be fairly uniform in the various heraldic courts of the kingdom. Grants may be applied for through any officer of arms. See HERALD.

The books of real use to the student are comparatively few in number. They comprise Woodward and Burnett's *Heraldry, British and Foreign, with English and French Glossaries* (2 vols. 1892; 2nd ed. 1896); Woodward's *Treatise of Ecclesiastical Heraldry* (1894); Parker's *Oxford Glossary* (2nd ed. 1894); Boutell's *Heraldry* (1874); Elvin's *Dictionary of Heraldry* (1889), of special value to draughtsmen. To the heraldic student Papworth's *Dictionary of Coats of Arms* and Burke's *General Armory* are valuable accessories. In Scottish heraldry Sir George Mackenzie's *Herauldrie* (1680); Nisbet's *Cadency* (1702), his *Armories* (1718), his *System of Heraldry* (2 vols. 1722 and 1742; new ed. 1816); Seton's *Law and Practice of Heraldry in Scotland* (1863); and the present Lord Lyon's *Ordinary of Scottish Arms* (1893; 2nd ed. 1903), are the recognized authorities.

Heralds' College. See HERALD.

Herat, cap. of W. Afghanistan, on the river Hari-Rud, about 400 m. W. of Kabul, and some 50 m. from the Russian and Persian frontiers. Founded by Alexander the Great, and now regarded as the 'gateway' to Afghanistan and India, the town is well fortified. Pop. estimated at 45,000.

Hérault. (1.) Department in S. of France, between the Cevennes

and the Mediterranean. Area, 2,400 sq. m. Two rivers, Orb and Hérault, divide it into three parts, each with a mountainous region, a belt of hills, and a low plain. Along the shore are lagoons. To the N.W. are the Cevennes, with several summits over 3,500 ft.; their N. slopes send a few streams to the Atlantic by way of the Tarn. Between the Orb and the Hérault is the chalky region, Causse de Larzac. Hérault is a rich agricultural department, producing much wine. Silkworms are bred. Salt is produced along the seashore. Among the minerals are zinc and coal. Stone, marble, and lime are quarried. The department contains numerous health resorts. Montpellier is the capital. Pop. (1901) 489,421. (2.) River, France, rising in the Cevennes, dep. of Gard, and falling into the Mediterranean 2 m. below Agde. Its total length is about 120 m.

Herbal, a book containing the names and descriptions of herbs, or of plants in general, with their medicinal properties. The chief works so named are *The Grete Herbal* (1526); R. Dodoens' *A Nieuwe Herball*, trans. from the French by Henry Lyte (1578); Turner's *New Herball* (1551); Gerarde's *Herbal* (1597); and Parkinson's *Theatrum Botanicum* (1640). The word *herbal* is also used to signify a collection of herbs or plants.

Herbarium (or, less usually, *hortus siccus*), a collection of dried plants preserved for comparison and study. The method of preservation is to dry the specimens between sheets of absorbent paper, under pressure, and mount them on stiff paper of uniform size. Some plan should govern the collection—the illustration of a botanical problem, the flora of a given district, variations, etc. The Royal Herbarium at Kew contains 1,500,000 specimens, including a large number of 'types' on which species have been founded; that formed by Linnæus is now in the possession of the Linnean Society, London.

Herbart, JOHANN FRIEDRICH (1776-1841), German philosopher, was born at Oldenburg, and studied at Jena under Fichte. For a time a private tutor in Switzerland, where he visited the educationist Pestalozzi at Burgdorf, he was appointed professor at Göttingen in 1805. In 1809 he was called to Königsberg, and remained there until 1833, when he was recalled again to Göttingen. His metaphysical system has a certain resemblance to that of Leibniz, in that he regards the universe as a plurality of ultimate and independent units. But the 'reals' or metaphysical

units of Herbart, unlike the monads of Leibniz, are perfectly simple qualities. The appearance of complexity arises only when the reals are regarded externally in relation to each other; it does not belong to their inner being. Apart from its metaphysical basis, his psychology resembles that of the English associationists, though he goes beyond them in attempting to express psychological processes in terms of mathematical formulæ. His psychology was the most effective part of his system, and has contributed much to the progress of the science. Through the doctrine of apperception in particular, the Herbartian psychology has exercised a powerful influence on educational theory. His *Sämmtliche Werke* appeared in 12 vols. (1850-52). For translation of some of his educational writings, see Lange's *Outlines of Educational Doctrine*, by J. F. Herbart (1901); Felkin's *Introduction to Herbart's Science and Practice of Education* (1895); also *The Science of Education* (1897); *The Application of Psychology to the Science of Education* (1898); and *Letters and Lectures on Education* (1901). See A. Darroch's *Herbart and the Herbartian Theory of Education* (1903); Kinkel's *J. F. Herbart, Leben und Philosophie* (1903).

Herbelot de Molainville, BARTHÉLEMY D' (1625-95), French Orientalist, born in Paris; was Oriental secretary to the king of France, and from 1692 till his death professor of Syriac in the Collège de France. His *Bibliothèque Orientale* (1697; best ed. published at the Hague, 1777-82) contains abundant historical, biographical, and illustrative material relating to the peoples of the East, though not always critically digested.

Herbert, EDWARD, LORD HERBERT OF CHERBURY (1583-1633), English philosopher, historian, and diplomatist, was born at Byton-on-Severn, Shropshire. In 1610, and again in 1614, he took part in the war in the Low Countries. In 1619 he was appointed English ambassador at Paris, an office from which he was suddenly recalled in 1624. Of his life up to this period a brilliant and highly-coloured account is given in his *Autobiography* (1764; ed. by S. L. Lee, 1886). His last twenty-three years were passed in discontented retirement. Herbert's chief work is the *De Veritate* (1624), to the third edition of which (1645) were appended short treatises, *De Causis Errorum* and *Religio Laici*. The *De Religione Gentilium*, a verification of his theological views in the field of comparative religion, was published at Amster-

dam in 1663. His account of the Duke of Buckingham's *Expedition in Ream Insulam* appeared in 1636; his *Life and Reign of King Henry VIII.* in 1649. His *Poems* were published by his brother in 1665 (ed. by J. C. Collins, 1881). The *Dialogue between a Tutor and his Pupil* (1768) re-states and enforces his religious views in a popular way. Herbert was the first to make a systematic attempt at a comparative study of religions; but he looked upon all historical religions as corruptions of the pure and primitive rational worship. His views largely determined the deistical movement of the 18th century. In the second place, he was the first writer who anticipated the critical method by means of which Kant long afterwards gave a new direction to modern thought, emphasizing the importance of the inquiry into knowledge. Herbert takes universal consent as the highest criterion of truth. His adoption of this criterion laid him open to the attacks of Locke. See Rémusat's *Herbert de Cherbury* (1874); Güttler's *Herbert von Cherbury* (1897).

Herbert, GEORGE (1593-1633), younger brother of Lord Herbert of Cherbury, was born at Montgomery Castle in Wales. In 1618 he was appointed reader of rhetoric at Cambridge, and in 1619 public orator. In 1626 he took orders, and was given the Lincoln prebend of Leighton Bromswold, Hunts. In 1627 he resigned his Cambridge offices. In 1630 he was given the living of Bemerton, near Salisbury. Here he wrote his courtly and spiritual religious poetry, which before his death he sent to his friend Nicholas Ferrers, to be published or burned. Works: *The Temple* (1633; ed. by A. B. Grosart, 1891; ed. E. C. S. Gibson, 1899); *Jacula Prudentum* (1640); *The Country Parson* (1652, etc.); *English Works, newly arranged by Palmer* (1905). See *Life* by Izaak Walton (1670).

Herbert, SIR MICHAEL HENRY (1857-1903), English ambassador, fourth son of the first Baron Herbert of Lea; was chargé d'affaires at Washington (1888-89); secretary to the legation at Washington (1892-3). The same position was held by him at the Hague (1893-4), at Constantinople (1894-7), and at Rome (1897-8). From 1898 to 1902 he was secretary to the British embassy at Paris, and in 1902 was appointed British ambassador at Washington.

Herbert, SIR ROBERT GEORGE WYNNDHAM (1831-1905), English statesman, born at Brighton, and educated at Eton and Oxford, where he became a fellow of All Souls. His public career began

in 1855 as a private secretary to Mr. Gladstone; and in 1859 Sir George Bowen, the first governor of Queensland, persuaded him to accompany him there. On the formation of the first ministry Sir Herbert took office, and from 1860 to 1865 was premier of the colony. He returned to England in 1868; was permanent under-secretary of state for the colonies (1871-92), and agent-general for Tasmania (1893-6). His practical knowledge of colonial affairs and conditions, and his delicate and tactful methods, stood him in good stead through a time of transition from autocratic colonial government to almost complete independence. A strong supporter of the policy of preference and tariff reform, he was persuaded by Mr. Chamberlain in December 1903 to accept the chairmanship of the Tariff Commission.

Herbert, SIDNEY, FIRST LORD HERBERT OF LEA (1810-61), English statesman, born at Richmond, Surrey; M.P. for the southern division of Wiltshire (1832-60); Secretary to the Board of Control (1834-5), and the Admiralty (1841-45); and in 1845 became Secretary at War, and followed Peel in his conversion to free trade. He was War Secretary under Lord Aberdeen (1845-6); took a leading part in the movement for army reform after the Crimean war; in 1859 was again War Secretary under Lord Palmerston, and was created Lord Herbert of Lea (1860). He was a friend and supporter of Florence Nightingale, and tried to improve the condition of the Scutari hospitals. He effected the transfer of the Indian army to the crown, encouraged volunteering, and urged the adoption of rifled ordnance.

Herbert, WILLIAM, third Earl of Pembroke of the second creation (1580-1630), was born at Wilton, Wiltshire. A poet, and lord chamberlain to James I., he has sometimes been identified as the 'Mr. W. H.' to whom Shakespeare's *Sonnets* were inscribed, and who was one of the dedicatees of the first folio.

Herbivora, in zoology, a term formerly used to designate the ungulates, on account of the nature of their diet.

Herb-robort. See GERANIUM. **Herbs**, a term sometimes used as synonymous with 'sweet herbs' and 'pot herbs,' such as lavender, mint, sage, and balm; sometimes as synonymous with herbaceous plants, chiefly those which are perennial.

Herculaneum, ruined city of Italy, lay at the W. foot of Mount Vesuvius, 5 m. S.E. of modern Naples. Originally founded by the Oscans, and held by the Etruscans, it was captured by

the Romans in the Social war of 89 B.C., and made a colony. It was overwhelmed by eruptions of the volcano in 63, 79, and 472. The ancient city was accidentally discovered in 1711-19, and excavations have been carried on, but intermittently, since 1737. The work is difficult, as the greater part of the city lies under modern villages, and can only be excavated by tunnelling through a tough tufa. Most of the treasure-trove, such as papyrus MSS., vases, and domestic utensils, are now in the museum at Naples. See Furchheim's *Bibliografia di Pompei, Ercolano e Stabia* (1891).

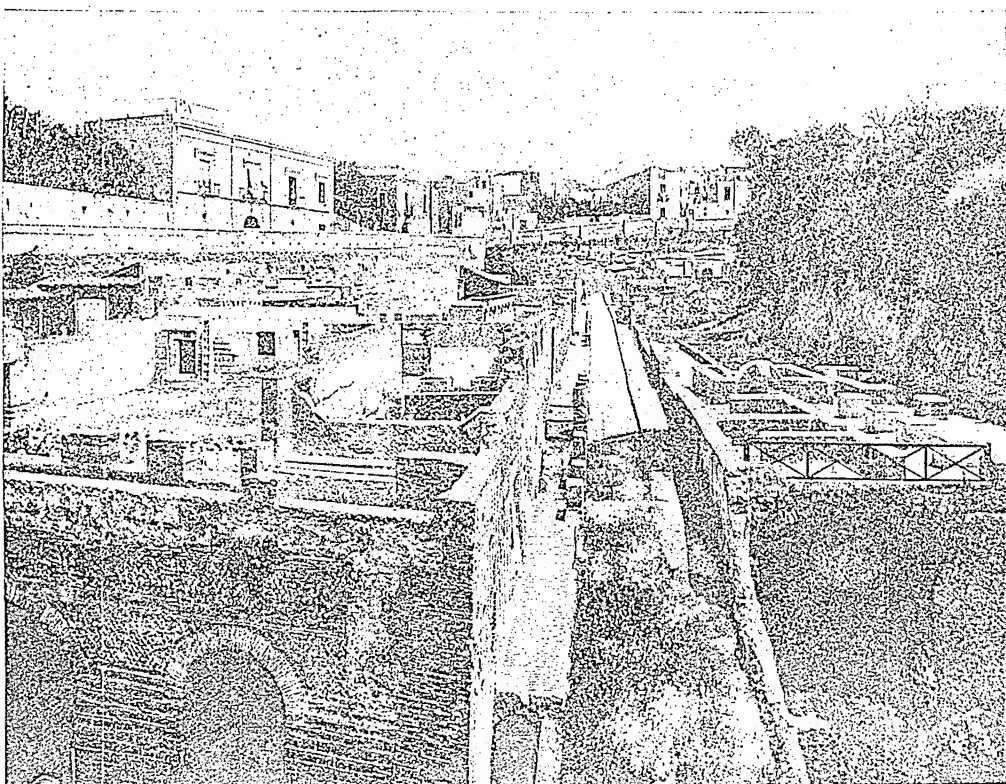
Herculano de Carvalho y Avarijo, ALEXANDRE (1810-77), Portuguese poet and historian, born at Lisbon. In 1828-32 he lived in Paris and London, to escape the despotism of Dom Miguel. His first poetical production was *A Voz de Propheta* (1836), followed in 1838 by the collection of poems *A Harpa do Crente*. Inspired by Scott, he published a series of 'national' novels, as *Eurico o Presbytero* (1843), *O Monasticon* (1844-8; 5th ed. 1867), and *O Monge de Cister* (1848). Not only did he inaugurate a national school of poetry and romance-writing, but he also applied modern historical methods to the history of his country, and wrote *Historia de Portugal* (4 vols. 1845-52), a work of great learning, faultless in the classic grace of its style, and *Da Origem e Estabelecimento da Inquisição em Portugal* (2nd ed., 3 vols., 1864-72). See Serpa Pimentel's *A. Herculano* (1881).

Hercules, called HERACLES by the Greeks, the greatest of the legendary heroes of Greece, was the son of Alcmena, the wife of Amphitryon, king of Thebes, by Zeus. As he lay in his cradle, Hera sent two serpents to kill him, but he strangled them with his hands. With a blow of his lyre he killed his master, Linus, for finding fault with him; whereupon Amphitryon sent him to feed his cattle. While so doing, Hercules slew a huge lion which ravaged the flocks. After that he wore the lion's skin for his ordinary attire, though some authorities say that his lion's skin was that of the Nemean lion. Next he killed Erginus, king of Orchomenus, who used to exact tribute from Thebes. Some time afterwards Hera drove him mad, and he killed his own children. When his sanity was restored, he went into self-exile, and was purified of his blood-guiltiness; then going to Delphi, he was ordered by the oracle to settle at Tiryns for twelve years, and to perform the tasks imposed on him by Eurystheus. These tasks were

the famous twelve labours:—(1) the slaying of the Nemean lion, which infested the valley between Cleone and Phlius; (2) the slaying of the hydra or water-snake of Lerna, a swamp near Argos; (3) the capture of the Arcadian stag, which had golden antlers and bronze hoofs; (4) the capture of the boar of Erymanthus, which he brought alive to Eurystheus; (5) the cleansing of the stables of Augeas, by turning the rivers Alpheus and Peneus through them, whereby he cleansed them in a single night;

ders while Atlas fetched them; (12) the rape of Cerberus, the dog of hell, from the lower world. Further, he is said to have fought with the Centaurs, and defeated them; though in his pursuit he accidentally killed his friend Chiron. On his return from the country of the Amazons he rescued Hesione, daughter of Laomedon of Troy, from a monster sent by Poseidon. Hercules in a fit of madness killed his friend Iphitus, son of Eurytus, and was then ordered by the Delphic oracle to serve three years for wages, and

When Hercules put it on, the poisonous blood entered his frame and caused him extreme agony; he tore it off with pieces of his own flesh, and was brought to Trachis in a dying state. Deianeira thereupon hanged herself. When his funeral-pyre was burning, a cloud descended and bore him away to Olympus, where he became a god and wedded Hebe. One of his famous acts was that he established the Olympian games. He was especially honoured by the Dorians; the royal houses of Argos, Sparta; and



Excavations at Herculaneum.

(6) the slaying of the Stymphalian birds, monsters with brazen claws and beaks, which dwelt on a lake near Stymphalus in Arcadia; (7) the capture of the mad Cretan bull, which Poseidon had sent to Minos; (8) the capture of the mares of the Thracian Diomedes, king of the Bistones, which ate human flesh; (9) the seizure of the girdle of Hippolyte, queen of the Amazons; (10) the capture of the oxen of Geryon, king of Erythia; (11) the quest of the golden apples, guarded by the Hesperides, to obtain which Hercules held up the heavens on his shoul-

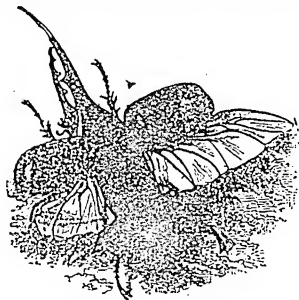
pay his earnings to Eurytus. Accordingly he became the servant of Omphale, queen of Lydia. Afterwards he helped the gods against the giants; and later took Pylos, and slew all the family of Peleus except Nestor. Next he went to Calydon, and won Deianeira for his wife, after a contest with the river god Achelous. Then he settled at Trachis, and marching against Cechalia, took it, and killed Eurytus and his sons, and carried off Iole. Deianeira, fearing that Iole would supplant her, sent Hercules a shirt steeped in the blood of the Centaur Nessus.

Messene all traced their descent from him. He was also much worshipped at Rome; and there were also an Egyptian, a Cretan, and an Indian Hercules: Varro is said to have enumerated forty-four heroes of the name. Sophocles's *Trachiniae* and Euripides's *Hercules Furens* are plays dealing with phases of his story.

Hercules, or **HERACLES**, an illegitimate son of Alexander the Great, by Barsine, daughter of Artabazus, and widow of the Rhodian Memnon. He lived at Pergamus until 310 B.C., and was murdered by Polysperchon in 309.

Hercules, an ancient constellation, between Ophiuchus and Draco, originally representative (it would seem) of the Euphratean sun-god Izhubar. Cerberus and the Apple-Branch, reminiscent of the fruits of the Hesperides, are comparatively modern adjuncts to the constellation. The chief star varies irregularly from 3.1 to 3.9 magnitude; a banded spectrum corresponds to its red colour, which contrasts with the bright green tint of a sixth magnitude companion. The well-known binary, ζ Herculis, revolves in about thirty-five years, and approaches the earth at the rate of forty-four miles a second. Near it is situated the magnificent globular cluster Messier 13.

Hercules, **PILLARS** of, the two rocks which form the western entrance to the Mediterranean Sea, Calpe (the Rock of Gibraltar) and Abyla (Ceuta). Ancient authorities, such as Mela and Pliny, considered that the pillars were rocks torn asunder by Hercules, so as to open the Atlantic Ocean into the Mediterranean; others again, that he once joined them to make a bridge, or fixed them to narrow the strait and to exclude the monsters of the ocean.



Hercules-beetle.

Hercules-beetle (*Dynastes hercules*), a beetle belonging to the same family as the goliath-beetle, and remarkable for its large size, the male sometimes reaching a length of over five inches. It is a native of the West Indies and of tropical America.

Hercynian Forest, anciently the wooded mountainous region lying N. of the Lower and Middle Danube. In modern geography the name designates the mountains of Central Germany and of N. Austria from the Carpathians to Prussia.

Herd, **DAVID** (1732-1810), Scottish author, born at Marykirk, Kincardineshire; was a collector and student of Scottish literature and antiquities. He published in 1776 two volumes of *Ancient and Modern Scottish Songs and Heroic Ballads*; also *Songs from David Herd's Manuscripts* (1904).

Herder, **JOHANN GOTTFRIED VON** (1744-1803), German writer, was born at Mohrungen in East Prussia. From 1762-4 he studied theology at Königsberg, learning most from Hamann, the 'Magus of the North,' and from Kant. He then became a schoolmaster at Riga, and took orders (1767). Two years after this he travelled to France, and met some of the foremost men of letters at Paris. In 1771 he was at Strassburg, where he exerted considerable influence on Goethe. He received an appointment as chief pastor at Bückeberg, and stayed there until 1776, when Goethe secured for him a similar appointment at Weimar, which he held until his death. Many of Herder's works are theological and philosophical (he became a violent opponent of Kant). His *Ideen zur Philosophie der Geschichte der Menschheit* (1784-91; Eng. trans. 1800) traces the history of mankind to the time of the Crusades. He supplemented the critical labours of Lessing by his *Fragmente über die neuere deutsche Literatur* (1766-7) and *Kritische Wälder* (1769). He drew attention to the interest and beauty of popular poetry by his *Ossian und die Lieder alter Völker* (1773), and especially by his *Volkstlieder* (afterwards called *Stimmen der Völker in Liedern*, 1778-9), a selection of popular songs drawn from many languages, and showing his remarkable skill as a translator. He also wrote the epic poem *Der Cid* (1805; Eng. trans. 1828), based on Spanish romances and an old French account of the mediæval hero's exploits, and some *Legenden und Paramythien*, short poems with a didactic tendency. One of his best books, *Vom Geiste der Ebräischen Poesie* (1782-3), was translated into English as *The Spirit of Hebrew Poetry* (1833). B. Suphan has published the critical edition of his complete works (32 vols. 1877-89) and a selection (4 vols. 1884-7). His biographers are R. Haym (2 vols. 1880-5) and E. Kühnemann (1893-6). See also H. Nevinson's *Herder and his Times* (1884).

Herdman, **ROBERT** (1829-88), Scottish painter, was born at Rattray, Perthshire, and first exhibited at the Royal Scottish Academy in 1850. Awarded the Keith prize and bronze medal of the Academy in 1854, he was elected associate (1858), and academician (1863). Among his chief works are *After the Battle: a Scene in Covenanting Times* (1870), and *A Conventicle Preacher Arrested* (1873). As a portrait painter he held a leading position in Scotland. A series of pictures illustrating Sheriff Bell's poem, *Mary Queen of Scots*, was exceedingly popular.

Herdman, **WILLIAM ABBOTT** (1858), professor of natural history at University College, Liverpool, since 1881, born at Edinburgh; drew up a report for the Ichthyological Committee (appointed by the Board of Trade, 1901) on a scheme for the exploration of the Irish Sea, and assisted in establishing a marine biological station at Port Erin, Isle of Man, and the Lancashire sea-fisheries laboratory and sea-fish hatchery at Piel, near Barrow. He was deputed by the Colonial Office (1901) to report on the Ceylon pearl fisheries. (*Report* issued 1903.) He has published *Report upon the Tunicata of the 'Challenger'* (3 vols. 1882-9); *The Fauna of Liverpool Bay* (4 vols. 1886-1900); *Oysters and Disease* (1896-9); *Fishes and Fisheries of the Irish Sea* (1902).

Heredia, **JOSÉ MARIA DE** (1842-1905), French poet, born near Santiago de Cuba. With Coppée, Sully-Prudhomme, Verlaine, and others, he formed the group of innovators surrounding Leconte de Lisle, and known as 'Les Parnassiens.' The watchword of the school was 'form,' technical perfection being held of supreme importance. Heredia's sonnets were collected under the title of *Les Trophées* (1893; trans. as *Sonnets* by E. R. Taylor, 3rd ed. 1902), and proclaim him the undisputed master of that form of art, and one of Europe's most consummate artists in words. He was elected to the Academy in 1894.

Hereditaments. 'Whatever may be inherited is a hereditament, be it corporeall or incorporeall, real or personal, or mixt,' says Coke. In an English conveyance the word will pass almost any kind of property.

Heredity, a biological term for the relation of genetic continuity between successive generations. The material basis of inheritance in all ordinary cases of sexual reproduction is the germinal material of the fertilized egg-cell. When a portion of a relatively simple organism, such as sponge, zoophyte, sea-anemone, or worm, is artificially or naturally separated off, it often grows into a perfect reproduction of the whole; and this regenerative capacity becomes to some extent intelligible when we observe that the separated portion, even if only a fragment, contained a fair sample of the different kinds of cells characteristic of the intact organism. Similarly, when a unicellular organism, such as an infusorian, divides or is cut into several parts, each may develop into a perfect likeness of the original. The fact that a fragment which contains no nuclear material will not grow into a

whole, but soon dies, shows that nuclear material plays an important rôle in the transmission of specific qualities. If it is not the exclusive vehicle of heritable organization, it is at least an essential part of it.

In ordinary cases of sexual reproduction the problem seems at first sight more difficult, for what reproduces the likeness of the parental type is a fertilized egg-cell—the union of two gametes, the ovum and the spermatozoon. But we try to render this more intelligible by the conception of germinal continuity. In some cases the germ-cells are visibly unspecialized lineal descendants of the fertilized ova which gave rise to the two parents; in some cases they are demonstrably set apart at a very early stage, and do not share at all in the making of the body; in metaphorical words, they continue the protoplasmic tradition of the original fertilized ovum with such intactness or integrity that when they or their descendant germ-cells are liberated in turn, they behave as their antecedents did, and like begets like.

'In every development,' according to Weismann, 'a portion of the specific germ-plasm which the parental ovum contains is unused in the upbuilding of the offspring's body, and is reserved unchanged to form the germ-cells of the next generation. . . . The germ-cells no longer appear as products of the body—at least not in their most essential part, the specific germ-plasm; they appear rather as something opposed to the sum total of body cells; and the germ-cells of successive generations are related to one another like generations of Protozoa.' Or as E. B. Wilson expresses it in his exposition: 'It is a reversal of the true point of view to regard inheritance as taking place from the body of the parent to that of the child. The child inherits from the parent *germ-cell*, not from the *parent-body*; and the germ-cell owes its characteristics not to the body which bears it, but to its descent from a pre-existing germ-cell of the same kind. Thus the body is, as it were, an offshoot from the germ-cell. As far as inheritance is concerned, the body is merely the carrier of the germ-cells, which are held in trust for coming generations.'

This fundamentally important general idea of germinal continuity may be accepted without committing ourselves to any particular theory of 'germ-plasm.' But since a continuous chain of germ-cells cannot be demonstrated in the majority of cases, we feel the need of Weismann's corollary, that the continuity de-

pends on the unchanged persistence of part of the original germ-plasm—i.e. of a specific germinal material resident in the chromatin of the nuclei. This germ-plasm is the substance which enables the germ-cell to build up an organism; it is the immortal bearer of all the heritable qualities. But as we cannot in the strict sense demonstrate either the germ-plasm or its continuity, the theory must be treated like other conceptual interpretations, and tested by its power of fitting the facts. (See also the articles EMBRYOLOGY and BIOLOGY.) It is enough to note that the idea of germinal continuity may be traced back to Virchow's *Cellular-Pathologie* in 1858; that, even before the publication of Virchow's classic, it was grasped by Owen in 1849 (see his essay on *Parthenogenesis*), though he afterwards, apparently, lost hold of it (see his *Anatomy of the Vertebrates*); that Haeckel, Rauber, Brooks, Jaeger, Nussbaum, and Galton in particular, all suggested the same idea. It is to Weismann, however, that biology is particularly indebted for a vindication and elaboration of the doctrine of genetic, or rather germinal, continuity.

A reference to the discussion of fertilization in the article EMBRYOLOGY will make it plain that in all ordinary cases of sexual reproduction (i.e. with the exclusion of parthenogenesis) the inheritance must be dual. There is a complete hereditary equipment of paternal origin, and another complete equipment of maternal origin; and these form the warp and woof of the organism, though it does not by any means follow that both will be equally expressed. For it is always necessary to distinguish between the actual inheritance (if we could only know it) and the expression of that inheritance in development, since it is certain that some of the transmissible characters of a parent may be unexpressed in the offspring and yet reappear in the grand-offspring, which shows that they were part of the inheritance all the time. But while the inheritance is altogether composed of the contributions brought together by the paternal and maternal gametes (or sex-cells), it must be even more than dual, since each gamete is the descendant of an antecedent fertilized ovum. Thus we reach the idea, confirmed by statistical observations, that an inheritance is really multiple—that it is like a mosaic with contributions from many ancestors. How the heritable qualities are borne in potential form by the germ-cells is quite beyond our powers of conception, but we are equally unable to conceive

how the qualities of irritability and the like reside within a nerve-cell.

Facts of Inheritance.—(1.) The broadest fact of inheritance is that like tends to beget like; that the members of a species tend to 'breed true'; that a relative constancy in the assemblage of specific characters is sustained from generation to generation. On the other hand, it is evident that the resemblance between offspring and their parents is far from being thorough; there may be incompleteness in the expression of the inheritance, the augmentation of one character and the diminution of another, the appearance of something novel, or the assumption of a new position of organic equilibrium. In other words, against the fact of hereditary resemblance we have to place the fact of variability. (2.) Since Prosper Lucas wrote his great treatise (1847) proving the heritability of all sorts of characters, bodily and mental, normal and abnormal, important and trivial, there has been no need to waste time in proving again that any constitutional or inborn peculiarity may be transmitted. When the broad facts of inheritance have been denied or depreciated, as they were by Buckle, for instance, it has usually meant that a preoccupation with the importance of 'nurture' (influences of function and environment in the widest sense) has led to an ignoring of the importance of 'nature'; or else that a preoccupation with humankind, where the external heritage (of custom and convention, institution and literature, etc.) counts for so much, has led to inferences which are quite inapplicable to the majority of living creatures. It is evident that similar 'nurture' may evoke the same structural result on many successive generations, and yet this result may never form part of the hereditary 'nature.' But after making these reservations, we may confidently say that the transmissibility of inborn characters of structure and function, both of body and mind, both normal and abnormal, has been proved almost all along the line. We say 'almost,' since it was only the other day that the heritability of fertility and fecundity, for instance, was definitely proved in the case of man.

In regard to the inheritance of diseases, we must be content with a few elementary statements. Bacterial diseases, such as tuberculosis and syphilis, cannot from their very nature be transmitted as such, yet (a) constitutional predispositions towards some of those diseases—e.g. to tuberculosis—are certainly heritable; (b) the offspring may be infected

—e.g. with syphilis—before birth, but infection is not inheritance; (c) the disease in the parents may prejudicially affect the reproductive organs, and thus, probably, the germ-cells and the offspring, or may, in the case of mammals, cause some arrest in the development of the foetus by lessening or poisoning its (placental) nutrition. All diseased conditions or abnormalities which have an endogenous origin—i.e. which we feel compelled to trace back to some germinal (or blastogenic) defect—are transmissible, though, happily, it does not follow that they are transmitted. Thus, although external conditions may supply the awakening stimulus, there seems little doubt that the great majority of nervous disorders have their roots in some germinal defect, and are therefore in various degrees transmissible. But where a nervous disorder can be reasonably traced back to, say, very defective nutrition during some critical period of brain-development, the likelihood of transmission will be less, for even a thoroughly sound germ-plasm cannot express itself normally in a state of starvation. On the other hand, in the case of female mammals it is improbable that a seriously impaired nervous system will admit of the normal nutrition of a foetus, and thus a nervous disorder due to arrest of development may reappear in the offspring. (3.) When the body of a parent has, through abuse, become thoroughly saturated (a metaphorical expression) with a toxin or poison, such as alcohol or opium, it is likely enough that the reproductive organs or gonads will be prejudicially affected along with the body, and that the vigour or developmental power of the germ-cells will be impaired. (4.) There seems no good reason for believing in the transmissibility of exogenously acquired deformities or malformations, or abnormal conditions generally. For, so far as we know, all the cases cited in support of this belief admit of a simpler interpretation. As for the belief in the inheritance of mutilations, it is a sad instance of unscientific credulity. (5.) In contrast to the indubitable inheritance of predispositions to certain diseases, we have to place the fact of the inheritance of immunity; for while there is only very insecure evidence in support of the transmissibility of artificially acquired immunity (by antitoxins, etc.), there seems no doubt that immunity—e.g. to yellow fever—may arise as a germinal variation, and become part of the natural inheritance of a race. See Reibmayr's *Immunisierung der Familien* (1898).

Different Modes of Inheritance.

—We use this phrase in reference to the fact that the paternal and maternal contributions find very varied expression in development. Three common cases are the following: (a) the offspring may exhibit an intimate mixture of the characters of its two parents—e.g. when the foal of a dark horse and a light mare is intermediate in colour (blended inheritance); (b) the offspring may take after one parent more or less exclusively (preponderant inheritance); (c) the offspring may show a purely paternal likeness in one part of the body and a purely maternal likeness in another part, and often, strange to say, with reference to the same general structure (particulate inheritance)—thus an English sheepdog may have a paternal eye on one side and a maternal eye on the other.

When the stock is thoroughly sound, the pairing of nearly related forms may occur without evil results generation after generation; but if a heritable taint should exist or should arise, the consanguineous pairing is likely to lead to disastrous results. The frequency of hereditary taint in man and in his domesticated animals is obvious, and several lines of experiment with mammals have shown that the augmentation of some constitutional weakness through close inbreeding may lead to general debility, frequent monstrosity, and final extinction. At the same time, there seems no doubt that inbreeding—i.e. pairing of related forms within a limited radius—is of frequent occurrence in nature, and that it is for an uncertain number of generations of very great importance in fixing the characters of a breed, or in developing the quality of prepotency. We say that an organism is prepotent when its hereditary peculiarities seem to have a great power of asserting themselves in the development of the offspring, even in opposition to the quite different peculiarities of the other parent. In other words, certain variations have a very strong power of hereditary persistence. But while inbreeding is thus of advantage in fixing characters or in developing prepotency, it seems to have its limits of usefulness, and after a time the breeder looks out for 'fresh blood'—i.e. for some judicious intercrossing with other races. Thus the general breeding formula for the successful evolution of a stock is, that periods of cross-breeding should alternate with periods of inbreeding. See Reibmayr's *Inzucht und Vermischung beim Menschen* (1897).

Observations on the various modes of inheritance are most definite when there are considerable differences between the two parents, and experiments on hybridization have thus a great theoretical interest. The hybrid offspring may be a blend, or it may be preponderantly like one of the parents, or it may resemble an ancestral form, or it may suggest a new departure altogether. See MENDEL'S LAW.

Reversion and Allied Phenomena.—It very frequently happens that a heritable characteristic of a parent is unexpressed in the development of the offspring, but reappears in the third generation. We suppose that this 'skipping a generation' means that the character in question did really form part of the inheritance, but that it remained latent in the germ-plasm through the second generation. Experiments show that a constitutional character which has been unexpressed for several generations may suddenly reappear: a pigeon may be hatched in the dove-cot with most of the characters of the ancestral rock-dove, or the progeny of a garden flower may return to the original wild form. These are the phenomena of reversion.

It does not follow, however, that what may be interpreted as a reversion necessarily is one. Thus (a) alleged reversion to more or less hypothetical ancestors who became extinct millions of years ago must be regarded with extreme suspicion. There is not a shadow of evidence for the belief that a man with superfluous digits is a reversion (in that respect) to 'a primitive heptadactyle vertebrate.' (b) Abnormal conditions which may be reasonably regarded as due to arrests of development at particular stages should not be cited as cases of reversion; and the same remark applies to conditions which can be directly traced to external influences. (c) Allowance should be made for coincidence; for a variation arising *de novo* may happen to be like one which occurred ten generations before, and yet it would not be a reversion. The term reversion (or atavism) should be restricted to those cases where, through inheritance, there reappears in an individual some character which was not expressed in his parents, but which did occur in an ancestor. The best illustrations of reversion are furnished by hybrids. Thus, in one of Cossar Ewart's experiments a pure white fantail cock pigeon, of old-established breed, which in colour had proved itself prepotent over a blue pouter, was mated with a cross; previously made between an 'owl' and an 'archangel,'

which was far more of an owl than an archangel. The result was a couple of fantail-owl-archangel crosses, but one resembled the Shetland rock-pigeon, and the other the blue rock of India. Not only in colour, but in shape, attitude, and movements, there was an almost complete reversion to the form which is believed to be ancestral to all domestic pigeons.

Filial Regression and the Law of Ancestral Inheritance.—We have already referred to the fact that there is a sensible stability of type from generation to generation. There is a tendency to keep up the specific average. This may be partly due to the action of natural selection, which weeds out extreme variations, often before they are born; but it is primarily due to the conditions of inheritance which involve 'filial regression.' Professor Karl Pearson gives this illustration:—Take a group of fathers, of stature 72 in.; the mean height of their sons is 70·8; there is a regression towards the mean of the general population. On the other hand, a group of fathers averaging 66 inches will have a group of sons of mean height 68·3 in.—again nearer the mean of the general population. In other words, children tend to differ less from mediocrity than their parents.

This big fact of 'filial regression' is to be accounted for in terms of that genetic continuity which makes an inheritance not dual but multiple. 'A man,' Professor Pearson says, 'is not only the product of his father, but of all his past ancestry; and unless very careful selection has taken place, the mean of that ancestry is probably not far from that of the general population. In the tenth generation a man has [theoretically] 1,024 tenth great-grandparents. He is eventually the product of a population of this size, and their mean can hardly differ from that of the general population. It is the heavy weight of this mediocre ancestry which causes the son of an exceptional father to regress towards the general population mean; it is the balance of this sturdy commonplaceness which enables the son of a degenerate father to escape the whole burden of the parental ill.' From his studies on inheritance of human faculties, and more especially by a series of studies on basset hounds, Mr. Galton was led by statistical methods to an approximate conclusion of much importance—the law of ancestral inheritance, which states that 'the two parents between them contribute on the average one-half of each inherited faculty,

each of them contributing one-quarter of it; the four grandparents contribute between them one-quarter, or each of them one-sixteenth; and so on.'

Doubtful Inferences.—There are several widespread beliefs, more or less closely connected with inheritance, that seem to rest on an altogether insufficient basis of fact. Thus there is the belief in telegony, or the influence of a previous sire on the subsequent offspring of the same mother by another father. For experiments and discussion, in no way confirmatory of the belief, see especially Cossar Ewart's *Peniculi Experiments* (1899). There is also the belief that maternal impressions during pregnancy may have a specific and representative effect on the developing embryo. For a scholarly and critical discussion, see J. W. Ballantyne's 'Teratogenesis: an Inquiry into the Causes of Monstrosities,' in *Edin. Med. Jour.* (1896).

Transmissibility of Acquired Characters, or Somatic Modifications.—An acquired character is defined, for the purpose of clear discussion, as a modification of the body directly referable to some change in function (use or disuse) or in environment. It is a structural change in the body of exogenous origin, and so far transcending the limits of organic elasticity that it persists for some time after the efficient cause has ceased to operate. Perhaps the phrase somatogenic modification as opposed to blastogenic variation is clearer, though clumsier, than acquired character. Thorough sunburning, callosities on the skin, thickening of the epidermis in plants, an exaggerated growth of hair in mammals taken to a new country, deformations of the skeleton due to peculiar occupations or exercises, an injury to heart or brain as the direct result of overexertion or overstimulation, the degeneration of a muscle through disuse, may be cited as examples of modifications, and a thousand more might be given. There is no doubt that functional and environmental modifications are very common, and that they would be of enormous racial importance if they were transmissible, but that has not yet been proved in any one case.

It is necessary to point out—(1) that the transmissibility of what look like modifications does not prove anything; (2) that the mere reappearance of genuine modifications generation after generation does not touch the question at issue of the inducing influences also persist; (3) that evidence showing that a serious modification may have some influ-

ence on the progeny is not what is wanted. The precise question at issue is whether a modification of a parent's body can affect the germ-cells in a manner so specific that the resulting offspring show a change comparable to, or in any degree representative of, the original modification. It is misleading to cite, in support of the affirmative, cases like the following: sheep imported to a new environment showed increase in the length of their fleece, their progeny showed a still greater increase; therefore the modification was transmitted. For it is evident that such cases are not of value unless they extend to the third generation at least; the second generation in the above instance had longer fleece than their parents probably because they were subjected to the modifying influence from birth (and before it), while the parents were influenced only from the date of transportation.

It is unprofitable to cite cases where modifications of unicellular organisms, such as bacteria, recur in the offspring; for the conception of an acquired character, defined as a somatogenic modification, is not readily applicable to cases where the distinction between soma and germinal material is only incipient. It is inconclusive to select cases where the organism was subjected to a pervasive and persisting influence—e.g. of climate or of alcohol—for a prolonged period, for it is quite possible that the germ-cells may be affected along with the body, and may when they develop express in the offspring some peculiarity referable to the disturbing influence. It would, of course, be quite unscientific to seek to foreclose a question which is still under discussion, and which demands many years of experimentation. In the meantime, however, it is necessary to say that secure evidence in support of the affirmative position is wanting, and that the balance of probabilities is towards a negative answer. Finally, it may be noted that in the case of man, where the external heritage is so important, there is often an approximation to what would result if modifications were transmitted.

A short sketch of the history of opinion on the subject will be found in J. A. Thomson's *Science of Life* (1893), and a detailed history in Van Bemmelen's *De Erfelijkheid van Verworven Eigenschappen* (1890). The affirmative position will be found represented in the writings of Herbert Spencer, Haeckel, Cope, and Eimer; the negative position in those of Weismann and Galton.

Indirect Importance of Modifications.—It has been suggested,

however, that these modifications may have some not inconsiderable indirect importance, and in the following way. It may happen that a germinal or constitutional change—a true variation—occurs in the same direction as the adaptive modification, and if the modification be of value in deciding survival, it may act, so to speak, as a shield for the incipient variation until this has gained strength. In this way a modification may help a variation, and may pave the way for it.

Theories of Heredity.—A theory of heredity has, above all, to interpret the fact that the fertilized ovum develops into an organism with the distinctive characters of the species, and with more or less close resemblance to the parents and immediate ancestry. As yet, all the scientific suggestions that have been offered may be ranked under two heads: they emphasize either the idea of germinal continuity or that of pangenesis. According to the latter, the germ-cells owe their uniqueness to the fact that they become receptacles of representative contributions (pangens, gemmules, etc.) from all parts of the organism. The most illustrious exponent of this hypothesis was Darwin. According to the former idea, the germ-cells of an organism owe their uniqueness to the fact that they are by continuous cell-division the unspecialized descendants of the fertilized ovum which gave rise to that organism, and, having retained its characteristic organization or germ-plasm, will in similar conditions develop in a similar way. One theory lays emphasis on the idea that the hen makes the egg; the other suggests, what seems nearer the truth, that the germ-plasm of an egg makes not only the hen, but the germ-plasm of its eggs.

In the foregoing article we have given attention mainly to the facts of inheritance, and to the disputed question as to the transmissibility of acquired characters. The extremely important recent rediscovery of Mendel's law is discussed separately. For a full treatment, see J. A. Thomson's *Heredity* (1905); W. Platt Ball's *Are the Effects of Use and Disuse Inherited?* (1890), a criticism of alleged cases; Bateson's *Materials for the Study of Variation* (1894); W. K. Brooks's *Law of Heredity* (1883), and *Foundations of Zoology* (1899), both remarkable books; S. Butler's *Life and Habit* (1878), expounding the memory theory of heredity; E. D. Cope's *Primary Factors of Organic Evolution* (1896), perhaps the strongest statement of the Lamarckian position; Darwin's *Variation of Plants and Animals under Domestication* (1868), also *The De-*

scent of Man (1871) and *The Origin of Species* (1859); C. Debierre's *L'Hérédité Normale et Pathologique* (1898); Dejerine's *L'Hérédité dans les Malades du Système Nerveux* (1886); Y. Delage's *L'Hérédité*, etc. (1895), a scholarly and critical work of great importance; G. H. Th. Eimer's *Organic Evolution* (Eng. trans. 1890); J. Cossar Ewart's *The Penicill Experiment* (1899), a fascinating record of very important experiments in breeding—*Nature*, September 1901, contains further results, and sums up his present conclusions; F. Galton's *Hereditary Genius* (1869), *Inquiries into Human Faculty* (1883), *English Men of Science, their Nature and Nurture* (1874), 'Natural Inheritance' (1889), a very important paper in *Proc. Roy. Soc. Lond.* (vol. lxi. 1897), and 'A Diagram of Heredity,' in *Nature* (lvii. 1898, p. 293); P. Geddes and J. A. Thomson's *The Evolution of Sex* (4th ed. 1901); E. Haeckel's *Generelle Morphologie* (1866), and *Die Perigenesis der Plastidule* (1876); D. J. Hamilton, 'On Heredity in Disease,' in *Scot. Med. and Surg. Jour.* (vi. 1900, pp. 289-303), an important lecture, followed by discussion; M. Hartog's 'The Fundamental Principles of Heredity,' in *Natural Science* (xi. 1897); E. Hering's *Das Gedächtniss als eine allgemeine Funktion der organischen Materie* (1870); W. His's *Unsere Körperform* (1875); J. Hutchinson's 'The Laws of Inheritance in Disease,' in Allbutt's *System of Medicine* (vol. i. 1896); G. Jaeger's *Zoologische Briefe* (1876), articles in *Kosmos* (1877, 1879), and *Lehrbuch der Zoologie* (1878), an early statement of the continuity theory; H. Kohlwey's *Arten- und Rassenbildung eine Einführung in das Gebiet der Tierzucht* (1897); F. le Dantec's *Evolution Individuelle et Hérité* (1898); O. Lorenz's *Lehrbuch der gesamten wissenschaftlichen Genealogie* (1898), a basis for the scientific study of human genealogy; Prosper Lucas's *Traité Philos. et Physiol. de l'Hérédité Naturelle* (1847), the first serious treatise on heredity; J. G. M'Kendrick's *Introduction to Text-book of Physiology* (1888); W. D. M'Kim's *Heredity and Human Progress* (1900); C. Lloyd Morgan's *Animal Behaviour* (1900), and *Habit and Instinct* (1896); C. von Nägeli's *Mechanisch-physiologische Theorie der Abstammungslehre* (1884); J. F. Nisbet's *Marriage and Heredity* (1889); K. Pearson's *The Grammar of Science* (2nd ed. 1900), with a very remarkable chapter on heredity. See also *The Chances of Death, and other Studies in Evolution* (vol. i. 1897); Th. Ribot's *Heredity* (Eng. trans. 1875; 2nd Fr. ed. 1882),

an indispensable book, chiefly psychological; E. Roth's *Die Thatsachen der Vererbung in geschichtlich-kritischer Darstellung* (2nd ed. 1885), full of interesting historical material; A. Sanson's *L'Hérédité, Normale et Pathologique* (1893), rich in facts about breeding of stock; H. Settegast's *Die Thierzucht* (1888), with a terse discussion of heredity from the breeder's point of view; Herbert Spencer's *Principles of Biology* (1864-6; 2nd ed. of vol. i. 1899); J. A. Thomson's 'History and Theory of Heredity,' in *Proc. Roy. Soc. Edin.* (1888-9); Sir William Turner, in *Nature* (xl. pp. 526-533); H. de Vries's *Intracellular Pangenesis* (1889); A. R. Wallace's *Darwinism* (1889); A. Weismann's *Essays on Heredity* (2 vols. Eng. trans. 1891 and 1892), *The Germ-Plasm* (Eng. trans. 1893), and *On Germinal Selection* (1896); E. B. Wilson's *The Cell in Development and in Inheritance* (2nd ed. 1900), indispensable as regards the material basis of inheritance.

Hereford, city, munic. and parl. bor., cap. of co. Hereford, on the Wyre, here crossed by a 15th-century stone bridge and the Victoria Suspension Bridge, 26 m. N.W. of Gloucester. Hereford was made a bishopric in the 6th century. The present cathedral was built 1080-1150. It contains many ancient monuments and an interesting library. The festival of the Three Choirs is celebrated here every third year. Of a castle, erected here prior to the conquest, only slight vestiges remain, with some portions of the city walls. Industries include leather, cider, and encaustic tiles. From 1294 to 1885 it returned two members to Parliament; it now returns one. Among natives are David Garrick and Nell Gwynn. Pop. (1901) munic. and parl. bor. 21,382.

Hereford, EARL OF. The bearer of this title is descended from William Devereois, sheriff of Hereford in the reign of Edward II. In the 15th century the name was changed to Devereux. In 1550 Walter Devereux (d. 1558) was created Viscount Hereford for his services in the French wars of Henry VIII. Walter (?1541-76), the second viscount, was created Earl of Essex in 1572, and was succeeded by his son Robert (1566-1601), the favourite of Queen Elizabeth. After holding the offices of lord-lieutenant of Ireland and earl marshal of England, Robert was convicted of treason and executed (1601).—His successor, also Robert (1591-1646), was attached to the royal cause until 1642, when he accepted a command in the Parliamentary army. Viscount Hereford is the premier viscount of England.

Herefordshire, inland co. of England, on the border of Wales. The surface is in parts very picturesque and well wooded. On the S.W. border are the Black Hills, on the E. the Malvern range, and the N. is hilly. The principal river is the Wye. Nearly all the land is under cultivation; orchards almost equal in extent those of Kent and Devon, and yield excellent cider and perry.

Hereros, a section of the Bantu race in Damaraland. In 1904-5 the Hereros were in open revolt against the Germans. See GERMAN SOUTH-WEST AFRICA.

Heresy, a term applied to views or doctrines at variance with prevailing or standard beliefs, but almost entirely restricted to the sphere of theology. The word occurs four times in the New Testament

to all who did not accept the church's doctrines in their entirety. From the first the orthodox and dominant party dealt severely with heretical teachers; after adequate warning and excommunication it put them under the ban of excommunication (cf. Titus 3:10); but when it came to wield the arm of the civil power, it could visit, and usually did visit, the offenders with corporal penalties as well. Thus, in 385 A.D., Priscillian, bishop of Avila, was put to death as a Manichee. A writ on the English statute book, *De heretico comburendo* (the burning of the heretic), dating from the reign of Henry IV., was expunged only in 1676. Deposition from office, and in the last resort excommunication, are now the severest penalties for heresy.

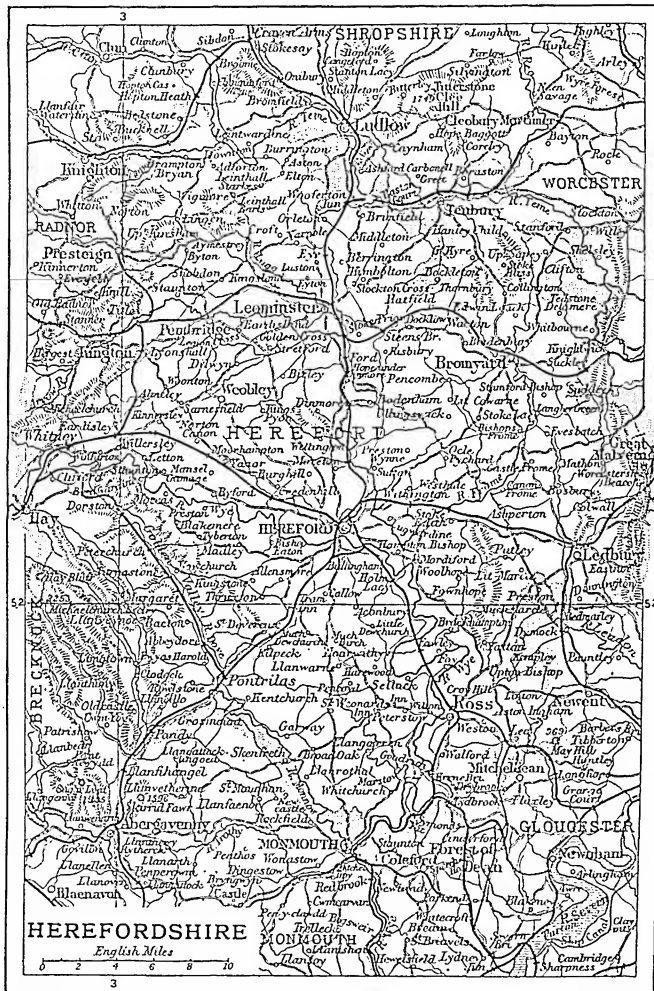
The various heresies that have vexed the church are treated in separate articles, ESSENE, GNOSTICISM, etc. (see CHURCH, HISTORY OF THE, and ROMAN CATHOLIC CHURCH). For the early Christian period, in which heresy was most rife, consult Hilgenfeld's *Ketzergeschichte des Urchristenthums* (1894), and Harnack's *Dogmengeschichte* (1893).

Hereward the Wake, English patriot, born near Bourne in Lincolnshire. After the Norman conquest he held out at the head of the resistant English for about a year in the Isle of Ely, until William penetrated into his marshy fastness by constructing a causeway. Hereward escaped, but his subsequent fate is not certain. Cf. Charles Kingsley's *Hereward the Wake* (1866).

Herford, tn., Prussian prov. of Westphalia, 37 m. by rail S.E. of Osnabrück; the seat of a Benedictine nunnery (838-1803) the abbess of which ranked as a peer of the empire. Linen is manufactured. Pop. (1900) 25,109.

Hergenröther, JOSEPH VON (1824-90), German cardinal and church historian, born at Würzburg in Bavaria, where he was appointed (1852) professor of church history. He became renowned by his *Anti-Janus* (1870; Eng. trans. 1870), in which he defended the dogma of papal infallibility. In 1879 he was created a cardinal, and appointed director of the Vatican archives. Among his other works are *Katholische Kirche und Christlicher Staat* (1872; Eng. trans. 1876); *Photius, Patriarch von Konstantinopel* (3 vols. 1867-9); and *Kirchengeschichte* (3rd ed. 3 vols. 1884-6).

Hergest, RED BOOK OF, ancient MS. of Welsh literature; takes its name from Hergest Court, a seat of the Vaughan family, where tradition asserts it was written. It contains eleven tales in Welsh, the name *Mabinogion* being given to the collection as a whole.



In the production of hops the county ranks second to Kent, though far below it. Herefordshire gives its name to a special breed of cattle. The county returns two members to Parliament. Among ancient remains are a cromlech called Arthur's Stone, numerous British intrenchments, traces of Offa's Dyke, and Watling Street. Area, 840 sq. m. Pop. (1901) 114,401.

(1 Cor. 11:19; Gal. 5:20; Acts 24:14, R.V. 'sect'; 2 Pet. 2:1), but only in the last instance does its meaning correspond to the later technical usage. It is to be noted that the New Testament condemns false teaching on the ground of its moral concomitants or results rather than as intellectual error pure and simple; it was left for a later time to deny salvation

The stories chiefly relate to the deeds of King Arthur and the early British kings. Lady Charlotte Guest translated them in 3 vols., with notes, in 1838-49, under the title of *Mabinogion*, published (1903) in the Temple Classics.

Heringsdorf, seaside resort in the Prussian prov. of Pomerania, on the coast of the island of Usedom, 40 m. n.w. of Stettin.

Heriot, an incident of copyhold tenure of land in England. It consists of the best beast or other chattel of a tenant, which the lord of a manor may take as a fine on the tenant's death. Before the conquest owners of freehold lands, who took men to work on their demesnes as tenants in villenage, supplied them with oxen and other beasts and implements. This is probably the origin of heriots as they now exist, but the term was originally applied to the arms given to a tenant by his lord and surrendered on death. See Sir F. Pollock and F. W. Maitland's *History of English Law* (1898), and Williams's *Real Property* (1896).

Heriot, GEORGE (1563-1624), Scottish goldsmith, born of an old family in Edinburgh, became goldsmith to James VI. (1601), and accompanied the court to London (1603), where he died. He is the 'Jingling Geordie' of Scott's *Fortunes of Nigel*. Heriot bequeathed the residue of his fortune (£23,625) to found and endow a school in Edinburgh for the education of poor burghers' sons. The existing constitution of Heriot's Hospital rests upon the Act of 1885, which, with other provisions, established from the funds valuable bursaries tenable at the school itself, the High School, the Heriot-Watt College, and University of Edinburgh. The hospital's annual revenue exceeds £31,000. According to their capabilities, pupils are given trades, or maintained at the university for four years. See William Steven's *History of George Heriot's Hospital* (3rd ed. 1872), and the various *Reports* of the Trustees.

Heriot-Watt College, Edinburgh, is subsidized from the funds of the Heriot Trust, which originated in funds left by George Heriot in 1624. Part of the funds, 'not less than £4,000 a year,' is set aside for the maintenance of the Heriot-Watt College. Its chief work consists in giving thorough scientific instruction at moderate fees to students in attendance at evening classes. Day classes for higher technical teaching were established at the college in 1888. During 1905-6 more than four thousand students were in attendance.

Heri-Rud, or HARI-RUD (anc. *Arius*), riv., Asia, rises on the w. slopes of Hindu-Kush, flows w. through Afghanistan past Herat. Its length is about 650 m. The river loses itself in the Tejend oasis.

Herisau, tn., Swiss canton of Appenzell, 7 m. by rail s.w. of St. Gall. It is a centre of the muslin industry. Near it are mineral springs. Pop. (1900) 13,497.

Heristall. See HERSTAL.

Heritable and Movable. This not strictly logical division of things and rights is fundamental in the law of Scotland. Heritable rights and subjects are those which descend to the heir, movable rights and subjects to the next of kin. Land and all rights affecting land are heritable. Leases, and all rights such as annuities, which bring in a yearly return and have no relation to a principal sum, are also heritable. Everything, on the other hand, that can be moved or is separate or detachable from land is movable—e.g. ships, household furniture, coins, shares, and stock. Heritable securities are now movable as regards succession, but continue heritable as regards all rights of courtesy and terce. The distinction between the two classes of rights is important, not only in succession, but between landlord and tenant, husband and wife, buyer and seller of land. Where a movable thing has been attached to land or to a building, the considerations which determine the class into which it falls are, whether it can be detached without injury to the principal subject, and the precise object for which the annexation was made. If the object were the improvement of the land or building, it becomes heritable; if not, it remains movable. See **FIXTURES**.

Heritable Jurisdictions, a relic of feudalism which survived in Scotland till 1748. These jurisdictions, of which there were nearly a hundred, were held from the crown, were mostly regalities and bailieries, and extended in some cases to the power of life and death. Compensation to the amount of £152,000 was given when these rights were abolished. See Argyll's *Scotland as it was and as it is* (1887).

Heritable Security, in Scots law, any security over heritable subjects where the creditor can exercise the usual diligences competent to heritable creditors. The commonest forms are the bond and disposition in security, the absolute disposition with backbond, and the real or reserved burden. If two securities compete, that which was first recorded in the Register of Sasines has the preference. Public burdens and

fou duty are preferable to any heritable security. Heritable securities (except the absolute disposition and backbond) are now movable as regards the succession of the creditor, except where executors are expressly excluded, but they are heritable as regards legitim, taxation, and rights of terce and courtesy.

Heritor, the modern word for the old term 'parishioner.' It includes all those who possess immovable property in a parish, with the exception of superiors and liferenters. It is the duty of the heritors to provide and maintain parish churches, manse, churchyards, and glebes.

Herkless, JOHN (1835), Scottish ecclesiastical historian, born in Glasgow; was minister of Tannadice, Forfarshire, from 1883 to 1894, when he was appointed professor of ecclesiastical history in St. Andrews University. His principal works are *Cardinal Beaton* (1891); *Richard Cameron* (1896); *The Church of Scotland* (1897); *Francis and Dominic* (1901); *Introduction and Notes to Hebrews* (1902); *The Early Christian Martyrs* (1904); and *The College of St. Leonard* (1905).

Herkomer, HUBERT VON (1849), English (naturalized) portrait and subject painter, born at Waal in Bavaria. At first he was engaged on black-and-white work, chiefly for *Fun* and the *Graphic*. In 1870 he exhibited water colours at the Dudley Gallery, and had his *After the Toil of the Day* hung on the line in the Academy. Thereafter he settled at Bushey, and founded his art school (1883). He exhibited his *Last Muster* in 1874; was elected A.R.A. in 1879, and R.A. in 1890. He was Slade professor of fine arts at Oxford (1885-94). Although such pictures as his *Chelsea Pensioners* are very popular, his best work is his portraits, such as those of *Miss Grant*, *The Lady in White*, *Tennyson*, and *Herbert Spencer* (Tate Gallery). See Baldry's *Hubert von Herkomer* (1901). His son, HERMANN G. HERKOMER, is also a well-known painter.

Herkulesbad, a wat.-pl. of Hungary, at the s.w. end of the Carpathians, 107 m. by rail s.e. of Temesvár. The waters were known and used in Roman times (*Aque Herculis*). Pop. (1900) 419.

Hermæ, or figures of Hermes, were square stone pillars, rudely carved with a representation of the god, which stood at the entrance of all private and public buildings in Athens, and also of gymnasia, at street corners, on highroads as sign-posts, at the boundaries of estates and countries, and at city gates. Their mutilation in 415 B.C. led indirectly to the disgrace and exile of Alcibiades.

Hermadad, or **HOLY BROTHERHOOD**, an association of towns in Aragon, Castile, and Leon, formed in the middle of the 13th century for their mutual protection against the nobles. It was reorganized in 1295, and still further extended in 1486 (in Castile) and 1488 (in Aragon). At this time Hermadad possessed tribunals and a police of its own. But as the absolutist power of the sovereigns grew the power of the Hermadad declined, and in the middle of the 16th century it became extinct. The name was then transferred to a body of military police in the pay of the council of Castile. One of their principal duties was to protect the roads, or rather travellers.

Hermann, **JOHANN GOTTFRIED JAKOB** (1772-1848), German classical scholar, born at Leipzig; became professor at Leipzig (1798), and died there. Besides producing annotated editions of classical authors, he devoted special study to ancient metres, on which subject he wrote *Handbuch der Metrik* (1799), and *Epitome Doctrinae Metricae* (1818; Eng. trans., *Elements of the Doctrine of Metres*, 1830); also to the development of improved principles in Greek grammar, expounded in his *De Emendanda Ratione Graecae Grammaticae* (1801). His *Opuscula* (8 vols. 1827-77) also contain much valuable matter. *Memoirs* by Jahn (1849) and Köchly (1874).

Hermannstadt (Hung. *Nagy-Szeben*), tn. and archiepisc. as well as episc. see of Hungary, chief tn. of Szeben co., on the Rapid Körös, at the northern foot of the Carpathians. The principal features are the numerous churches, and the antique town house containing the 'Saxon' archives and a collection of armour. The town also possesses the collections of the Transylvanian Carpathian Society, and a law academy. Distilling, pottery-making, milling, and other industries are carried on. It was in the possession of the Turks from 1663 to 1692. Pop. (1900) 26,077.

Hermanric, or **ERMANARIC**, king of the East Goths, founder of their kingdom towards the middle of the 4th century. When his territory was invaded by the Huns, Hermanric committed suicide. See **GOTHs**.

Hermaphrodite, an organism in which the two sexes are united. Hermaphroditism is the rule in flowers which typically contain both stamens and pistil, and is not uncommon in animals, especially in parasites and simple forms. It is usually stated that the hermaphrodite condition is the primitive one from which that of separate sexes has been

derived, and that hermaphrodites are either primitive or illustrate reversion, but it is by no means certain that this explanation applies to all the known cases. The condition may be normal to the species, or may occur sporadically in certain individuals. The term hermaphrodite cannot be legitimately applied to an animal unless it produce both ova and spermatozoa. In vertebrates, especially in the higher forms, abnormalities in development sometimes give to one sex the external appearance of the other, but that is not hermaphroditism.

In true hermaphrodites there is usually, though not invariably, cross-fertilization, as in earthworm, leech, and snail; and, as in flowers, there may be elaborate means to attain this end. Not infrequently the two kinds of products are brought forth at different stages in the life-history, so that the animal may be first male and then female—e.g. the hag. Parasites tend to be not only hermaphrodite but also self-fertilized, although, as in the case of the liver-fluke (*Distomum*), there may exist structural peculiarities which show that the species was primitively cross-fertilized. In cirripedes among Crustacea we have the interesting fact of the co-existence of hermaphrodites of large size and of minute 'complemental males,' whose function is doubtless to ensure an occasional cross.

In some animals there is embryonic hermaphroditism, the developing young containing rudiments of both male and female organs. A plausible explanation of sporadic hermaphroditism, as it occurs in, for example, the frog, is that it is a persistence of embryonic conditions. In all vertebrates with distinct genital ducts the embryo is so far hermaphrodite that it exhibits the ducts proper to both sexes, and in birds, reptiles, and mammals the male ducts abort in the future female, the female in the future male. See *The Evolution of Sex*, by Geddes and J. A. Thomson (2nd ed. 1900).

Hermaphroditus, a son of **Hermes** and **Aphrodite**, who became united with the nymph of the fountain of Salmacis, near **Halicarnassus**, the two forming one person, with the characteristics of both sexes.

Hermas, one of the apostolic fathers, and author of a quasi-apocalyptic work, the *Pastor* or *Shepherd*, which has been called the *Pilgrim's Progress* of the early church. The book consists of five visions, twelve mandates, and ten similitudes or parables—the division, however, is neither original nor appropriate

—and takes its name from the fact that the angel of repentance, whose utterances it embodies, appears under the disguise of a shepherd. In view of the corruptions of the church and the (supposed) imminent end of the world, he calls upon men to repent without delay; inveighs against worldliness, and warns of the danger of apostasy in time of persecution; and reproves the ambitions and dissensions of the church leaders. The *Shepherd* was held in great esteem in the ancient church, and is a valuable source of information regarding the condition of the Roman community in the 2nd century. Irenaeus quotes it as Scripture; Origen believed it to be divinely inspired, and attributed it to the **Hermas** mentioned in Rom. 16: 14; Eusebius, however, names it among the Antilegomena. The Muratorian canon assigns it to a brother of Bishop Pius of Rome (c. 150 A.D.); this statement serves to indicate the approximate date of its composition. Part of the original Greek is found in the Codex Sinaiticus, discovered by Tischendorf in 1859, until which year the *Shepherd* was known only in a Latin translation; subsequent discoveries (1863, 1888) have given us a complete Greek text. See Zahn's *Der Hirt des Hermas* (1868); Harnack and Gebhardt's *Patres Apost.*, ii. (1877); Clark's *Ante-Nicene Christian Library*, i.

Hermeneutics, the art or science of interpreting the language of a speaker or a writer. The term is now specially applied to the explanation of Scripture, and in practice covers what is meant by exegesis, in favour of which it is falling into abeyance. See **EXEGESIS**.

Hermes, called **MERCURIUS** by the Romans, one of the Greek gods, was the son of **Zeus**, and was born in a cave in Mount **Cyllene** in **Arcadia**. According to the legends, he had only been born a few hours when he stole the cattle of **Apollo**, which he drove from **Pieria** to **Pylos**. When **Hermes** grew up, **Zeus** made him the herald and messenger of the gods; it was also his duty to guide the souls of the dead to the lower world. As the herald of the gods, he was the patron deity of eloquence; as the god of prudence and cunning, he was worshipped by merchants and traders; and his reputation for ingenuity caused him to be regarded as the author of the lyre, the alphabet, numbers, gymnastics, weights and measures, etc. He was also worshipped as the patron of roads and travellers; hence the statues called **Hermes** were set up to him on roads and at the entrances of buildings.

He was also the god of luck. He was especially the patron of gymnastics; and he himself was represented in art as a youth whose figure showed the ideal perfection of graceful and harmonious development of the body, as in the famous statue of him by Praxiteles at Olympia. His regular attributes are a broad-brimmed cap, the herald's staff or caduceus, and the winged sandals which bore him on his journeys. The Homeric *Hymn to Hermes* gives the best account of his birth and childhood.

Hermes, GEORG (1775-1831), German philosopher and Roman Catholic divine, born at Dreyerwalde in Westphalia; was professor of theology at Münster (1807), and at Bonn (1819). His system aimed at basing Catholic faith and doctrines on a 'critical' theory of knowledge like Kant's. In 1835, after his death, his doctrines were condemned by the Pope, and the once influential Hermesian party dwindled away. Chief works: *Die Innere Wahrheit des Christenthums* (1805), *Philosophische Einleitung in die Christkatholische Theologie* (1819-29), and *Christkatholische Dogmatik* (1834-6). See Niedner's *Philosophie Hermesii Explicatio* (1839), and Stupp's *Die letzten Hermesianer* (1844-5).

Hermes Trismegistus. See THOTH and HERMETIC BOOKS.

Hermetic Books, a sort of encyclopedia of ancient Egyptian lore, of which fragments only survive, unless the whole or part of one of its divisions is to be recognized in the *Papyrus Ebers*. The portions that survive exhibit undeniable traces of the influence of late Greek or rather Alexandrine philosophy. The name is derived from Hermes Trismegistus, the Greek designation of Thoth, the Egyptian god of intelligence; though later the Neo-Platonists and some Christian writers regarded Hermes Trismegistus as an ancient sage, to whom they attributed the fragments. As the lore contained in these books was traditionally believed to have been mastered and guarded with jealous care by a comparatively small number of experts, the term 'hermetic' came to be almost synonymous with esoteric—i.e. something reserved to the initiated only. The fragments were translated into French by Ménard (1868). Compare Latin works on the subject by Baumgarten-Crusius (1827) and Hilger (1855), Pietschmann's *Hermes Trismegistus* (1875), and Kingsford's *The Hermetic Works* (1885).

Hermione, tn., Argolis, ancient Greece, on a promontory of its E. coast. Though originally an independent state, in

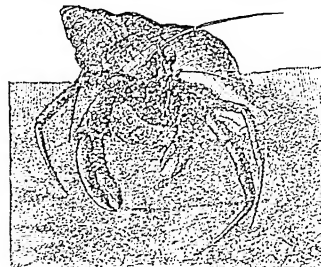
historical times it was subject to Argos. There survive ruins of a temple of Poseidon.

Hermit, one who retires from society in order to live a solitary life of meditation and devotion. It was perhaps natural that Christianity, with its demand of crucifixion of the world (cf. Gal. 6:14), should be understood by some as enjoining the abandonment of the ordinary secular life; and the early centuries witnessed a remarkable development of the practice, more or less helped by persecution. Thus, during the persecution under Decius, Paul of Thebes took up his residence in the Egyptian desert, though his story, as given by Jerome, is regarded as being largely romantic. The real father of Egyptian anchoritism is St. Anthony, whose privations and conflicts brought him great veneration. He was, though unlearned, a truly pious man; but his example was followed by many out of sheer pride. Occasionally strange and fanciful forms of separation were adopted—e.g. by the Stylite, the most famous of whom was one Simeon, who lived for years on the top of a pillar; and the Bosci, or Grazers, who lived on herbs. As Christianity spread to the west and north, the rigours of climate tended to prevent the transportation of hermitism, and its place was largely taken by monasticism. The solitary devotee is a feature of many religions, both ancient and modern, notably in Buddhism. See Müller's *Hist. of Christian Church*, i. 355 f., and literature there quoted.

Hermitage, a dry, red wine from the vineyards of the Rhone valley. It resembles burgundy in body and colour, at the same time possessing all the elegance of the best clarets.

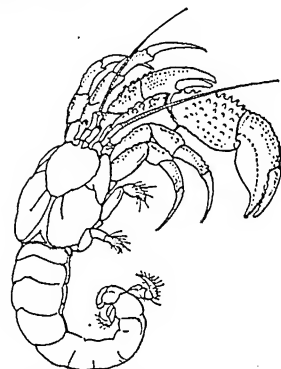
Hermit-crab, a decapod crustacean of the family Paguridae, characterized by its habit of appropriating empty gasteropod shells, in which it lives. The abdomen, being naturally soft and defenceless, is sheltered and protected by the borrowed shell. At the end of the abdomen there are two modified appendages of very unequal size, by means of which the hermit retains hold of the shell. The anterior part of the body is furnished with a hard coat, and is protruded from the shell under ordinary conditions, though it can be withdrawn on an alarm. It is furnished with the usual appendages, but the two posterior pairs of legs, which from their position would be useless in walking, are greatly reduced. A number of species occur in British seas, the commonest being *Eupagurus Bernhardus*, the form often abroad called Ber-

nard the Hermit. For the relations which exist between hermit



Hermit-crab in shell.

crabs, sea anemones, and other marine animals, see article COMMENSALISM.



Hermit-crab withdrawn from shell.

Hermocrates, a Syracusan who was the life and soul of his city's resistance to the expedition sent from Athens against Sicily in 415 B.C. After the Athenian defeat in 413 B.C., he aided the Spartans in carrying on war against Athens; but in 409 he and his colleagues were banished by the people of Syracuse. After that he settled at Selinus in Sicily, and thence waged war against Syracuse and Panormus. In 407 he obtained admission into Syracuse, but the people killed him.

Hermogenes, Greek rhetorician, born at Tarsus (Cilicia), flourished in the reign of Marcus Aurelius (2nd century), who sat at his feet. Before he was twenty he wrote a complete treatise on rhetoric, which was long used as a model in training public speakers; but at twenty-five his faculties failed. The text will be found in vol. i. of the *Rhetores Graeci* by Walz (1832); new ed., with commentaries by Rabe (2 vols. 1882-3).

Hermon (modern Jebel esh-Sheikh), triple snow-clad mountain peak (alt. 9,200 ft.), Syria, forming the S. extremity of the

Anti-Lebanon range. It is encircled with ruins of ancient temples dedicated to Baal worship, and is often referred to in Hebrew poetry.

Hermonthis (modern Erment), tn., in Esne prov., Upper Egypt, on l. bk. of Nile, 8 m. s.w. of Thebes. The ancient On of the South, it was famous for its worship of the gods Mont and Horus.

Hermopolis Magna, vil., Upper Egypt, l. bk. of the Nile, opposite to the famous rock tombs of Beni-Hassan. At one time it rivalled Thebes in the number and beauty of its temples. It is the modern Ashmunein or Esh-munein.

Hermosillo, city, Mexico, cap. of Sonora state, on Sonora R., 85 m. N. of Guaymas; has a mint, distilleries, and flour-mills. Sugar is extensively grown, and silver is mined. Pop. (1900) 17,618.

Hermopolis, or SYRA, cap. of the Greek nomarchy of the Cyclades, on the E. coast of the island of Syra, and centre of the Levant trade, with shipbuilding, and manufacture of 'Turkish delight,' cotton, flour, leather, etc. The trade averages about £400,000, though it has greatly declined since 1890. It is the seat of a Greek archbishop and a Roman Catholic bishop. Pop. (1896) 17,894.

Hernani, tn., prov. Guipuzcoa, Spain, 8 m. s.e. of San Sebastian; was the scene of many struggles in Carlist wars (1833-40 and 1872-5). There are iron mines. Pop. (1900) 3,672.

Herne, JAMES A. (1840-1901), American actor and dramatist, was born at Troy, New York. For the last twenty years of his life he appeared almost exclusively in his own plays. These include *Hearts of Oak* (1878); *Margaret Fleming*; *Shore Acres* (1892-3), a very popular play of rural life in New England; and *Rev. Griffith Davenport* (1899), a drama of the civil war. He was an excellent actor and skilful stage-manager, and one of the most remarkable figures in the theatrical life of America.

Herne Bay, tn. and wat.-pl., Kent, England, 7½ m. N.E. of Canterbury. In the vicinity canary grass is largely grown. Pop. (1901) 6,726.

Herne Hill, residential suburb of London, pars. Camberwell and Lambeth, in Surrey, England, 4 m. s. of St. Paul's.

Herne the Hunter, an old English legendary character who roamed at midnight round a famous oak in Windsor Great Forest, popularly supposed to have been blasted by the evil spirit of the hunter, assuming the shape of a great stag with huge horns. Shakespeare alludes to the legend in *The Merry Wives of Windsor*

(iv. 4). Herne's Oak, computed at six hundred and fifty years old, fell from natural decay in the night of Aug. 31, 1853. On the spot where it stood Queen Victoria planted a young oak. See Perry's *Herne's Oak* (1867), and Harrison Ainsworth's *Windsor Castle* (1843).

Hernia is the protrusion of an organ or of part of an organ from its natural position in the body. The term is commonly restricted to intestinal hernia.

A loop of bowel may be forced upward through the diaphragm (diaphragmatic hernia), or more often, and especially in children, it may be umbilical, the bowel being naturally pushed through the abdominal wall at its weakest point. Among adult women a similar weak point in the abdominal wall exists at the femoral ring, through which the great blood-vessels pass from the abdomen to the leg; and in both men and women the inguinal canal is frequently the site of hernia. The hernia may consist of bowel and omentum, or of omentum alone; but in either case as it is protruded it pushes in advance layers of the various tissues through which it passes, so that the external tumour consists of the hernia plus certain coverings, the outermost of which is the skin. Hernia, whether femoral or inguinal, is commoner in men than in women. Certain subjects, however, are predisposed to hernia by weakness or malformation, either congenital or acquired—e.g. as the result of previous operation upon the abdominal walls, or as the result, in women, of the relaxation of the abdominal walls which follows child-bearing. Lifting a heavy weight, violent coughing, or straining at stool may produce hernia.

Hernia is technically described, according to its condition, as *reducible*, *irreducible*, *strangulated*, *incarcerated*, *inflamed*, or possibly *gangrenous*. A reducible hernia is one which can, without operation, be pushed back by gentle manipulation into the abdominal cavity, through the channel along which it advanced, the patient being placed on his back, with thighs and knees flexed in order to relax the abdominal walls. No force must be applied which is at all likely to bruise or injure the gut. Irreducible herniæ are often of long standing, and consequently have many adhesions which render operation inadvisable; but when a hernia suddenly becomes irreducible, operative interference is generally to be advocated on account of the danger of strangulation. A strangulated hernia is one which is so tightly nipped by surrounding tissues

that the circulation of the blood in the part is arrested. This is a most serious condition, and if not relieved by operation (i.e. cutting the constricting band), it results in gangrene of the bowel and probably in death. A hernia may sometimes be reduced without relieving the strangulation, when the constricting band is returned with the hernia, and still nips it. An incarcerated hernia is one which is irreducible, and in which the hernial loop of bowel has become obstructed by its contents (i.e. faeces, etc.). Both the strangulated and the incarcerated hernia are liable to inflammation and gangrene.

Symptoms.—Hernia produces a swelling, of varying size, most commonly in or near the groin. It is not necessarily painful, except perhaps at the time of its production. The swelling is greatest when the sufferer stands upright, coughs, or strains. In the case of many reducible herniæ, the lump disappears altogether when the patient lies down, but returns directly he rises. Should the hernia become strangulated or incarcerated, temporary pain ensues, with constipation (sooner or later), vomiting, loss of impulse in the swelling on coughing, increased size, and finally collapse. At a late stage the pain disappears, and it may be wrongly supposed that the condition is improved.

Treatment.—A hernia is never safe unless reduced and prevented from returning, either by a truss (which is generally only palliative, except in children) or by operation, which consists in cutting down on the hernia, freeing it from all constriction, returning it to the abdominal cavity, and then closing up the passage by which it descended. A truss must never be placed on an unreduced hernia. Either a light pattern should be worn at night, or else the truss should be removed only after lying down, and replaced before rising. In young children a truss constantly worn for some years may cure the hernia; the older the child, the longer it must be worn. In the umbilical herniæ of children a cure may be effected by the constant application of a broad strip of stout sticking-plaster, drawn tight across the navel. Only fluid food should be taken until the hernia is reduced, and constipation should on no account be treated by purgatives, which may force more intestine through the breach in the abdominal wall, and increase the difficulty of return.

Hernici, Sabine people who dwelt in Latium in ancient Italy. Their chief town was Anagnia. They were friends of

the Romans, with whom they made a league in 486 B.C., and to whom they were loyal allies until 362, when they rebelled for four years. They remained faithful when the Latins revolted about 340, but in 308 they joined the Samnites against Rome. They were, however, soon conquered, and lost their independence.

Hernösand, tn., Västernorrland co., Sweden, 3 m. from mouth of Angörman R. It is the seat of a bishop. There are a wood pulp industry and sulphite mills. Pop. (1900) 7,890.

Hero, in Greek mythology. See LEANDER.

Hero of ALEXANDRIA (lived 1st or 2nd century B.C.), mathematician, was probably an Egyptian, but wrote in Greek. He invented a water-clock, a hydraulic organ, and a compressed-air catapult; studied the determination of areas, volumes, and heights; described levers, wedges, screws, pulleys, a fire-engine, a self-trimming lamp, an æolipile, and a theodolite; and discovered the formula for the area of a triangle in terms of its sides—

$$\sqrt{s(s-a)(s-b)(s-c)},$$

where a , b , c are the lengths of the sides, and s the semi-perimeter. See Schmidt's *Heronis Alexandrini Opera* (1899, etc.), and Schöné's *Hero von Alexandrien* (1903).

Herod, or **HERODES**. (1.) **HEROD**, called the **GREAT** (62–4 B.C.), king of the Jews, was of an Idumean family. He obtained the government of Galilee in 47 B.C.; the next year was made governor of Coele-Syria; and king of Judæa, by Augustus and Antony, in 40 B.C. The Jews, however, supported Antigonus, of the rival Hasmonæan dynasty, and it was only after a prolonged siege that Herod made himself master of Jerusalem. He amassed great wealth by confiscating the property of his enemies, which he expended on the restoration of Samaria, the building of Cæsarea, and of the temple at Jerusalem. It was in the last year of his life that he ordered the 'massacre of the innocents' at Bethlehem (though this is not mentioned by Josephus). Cf. Stephen Phillips's drama, *Herod the Great* (1900). (2.) **HEROD ANTIPAS**, son of Herod the Great, became tetrarch of Galilee and Peræa. He married Herodias, his brother Philip's wife, and imprisoned and executed John the Baptist for censuring this act. In 38 A.D. he went to Rome to try to obtain the title of king from Caligula; but Agrippa prejudiced the emperor's mind against him, and he was deprived of his dominion, and exiled first to Lyons and then to Spain. (3.) **HEROD**

AGRIPPA, called the **GREAT**, was the son of Aristobulus, son of Herod the Great. Caligula made him governor of Abilene, Batanæa, Trachonitis, and Auranitis, to which Claudius added Judæa and Samaria. In 44 A.D. he had the apostle James executed and Peter imprisoned. He died at Cæsarea in the same year, 'eaten up of worms.' (4.) **HEROD AGRIPPA II.** (30–100), son of the above, took the Roman side when the Jews began war with Rome in 67, and after the capture of Jerusalem in 70 he retired to Rome, where he died. It was before this Agrippa and Festus that the apostle Paul made his defence at Cæsarea.

Herodas. See **HERONDAS**.

Herodes Atticus. See **ATTICUS**, **HERODES**.

Herodians, a Jewish political party who appear to have had much in common with the Sadducees, and were more in sympathy with the Roman government than with the old theocracy of the Pharisees or the new religion of the Messiah.

Herodianus, Greek historian of Rome, who appears to have lived chiefly at Rome. His *History* covers the period from the death of Marcus Aurelius in 180 to the beginning of the reign of Gordian III. in 238. His style is clear and vigorous, and his narrative is, on the whole, truthful and impartial. Ed. by Mendelssohn (1883); Eng. trans. (1789).

Herodotus, sometimes called the 'father of history,' is the first of the Greek historians whose works have come down to us. The main subject of his work was the war between Persia and Greece, in which he saw the final issue of a struggle that had been going on for centuries between the East and the West. Consequently he begins with what he considers to have been its causes, and introduces digressions and episodes which had a more or less close connection with his subject. But his work is not merely a bare narrative of facts. Herodotus had a theory of history, partly philosophical, partly theological, and the facts are marshalled and interpreted in accordance with it. The theory was a modification of the old Greek belief in 'the golden mean.' Whatever exceeded a just proportion was supposed to excite the envy of the gods, and to bring with it punishment and disaster; hence it was that the pride and power of Xerxes were doomed to failure. The historian was born at Halicarnassus, and is stated to have been fifty-three years of age in 431 B.C., when the Peloponnesian war broke out. In that case his birth would have taken place in 484 B.C. Whether he lived there or not, Herodotus

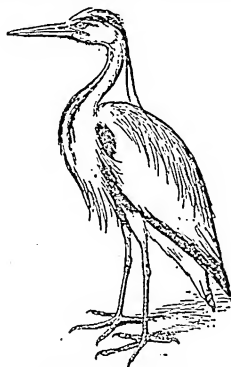
was well acquainted with Samos. When he visited the battlefield of Papromis in Egypt, where the Persian troops had been defeated by the Libyan Inaros in 456 B.C., the bones of the combatants were still lying on the ground (iii. 12). On the other hand, the revolt of Amyrtæus seems to have been already suppressed when he went up the Nile, which would date his visit to Egypt after 449 B.C.; and Kirchhoff has pointed out that he must have been at Delphi after 448 B.C. Tradition asserted that he played an important part in the revolution at Halicarnassus, by which the tyrant Lygdamis was expelled, but that he was himself subsequently exiled by the democracy. Certain it is that he resided for a time at Athens, and took part in the foundation of the colony of Thurii in Southern Italy; and at Thurii it is more than probable that he died. The history of Herodotus met with hostile criticism from the first. Thucydides corrected some of its statements; Ctesias contradicted in detail the parts of it which relate to the East; and the pseudo-Plutarch published a treatise to prove that the old historian was not only incorrect, but dishonest as well. As a matter of fact, the work of Herodotus contains much that is derived from popular legend and the fictions of the professional dragoman, and in so far as is an invaluable storehouse of ancient folklore. Nor did Herodotus possess much critical judgment: where more than one version of an event had come down to him, he preferred that which best illustrated his theory of the working of destiny. Moreover, he borrows from his predecessors without acknowledgment, in accordance with the general custom of the day; indeed, it is often difficult to say whether he is using the words of another writer or really describing his own experiences. His travels did, however, extend from Syria to Italy, and embraced the northern half of Egypt, as well as the coasts of Asia Minor and the islands and mainland of Greece. Wherever he is describing his own experiences he is thoroughly trustworthy, even though his ignorance of foreign languages made him dependent on his dragoman, and sometimes mistaken in his interpretation of what he saw. Best editions: with commentary and translation into English, by Rawlinson (2nd ed. 1876; new ed. 1897); with commentary in German, by Stein (6th ed. 1901); new ed. of bks. i.–iii., by A. H. Sayce (1883), of bks. iv.–vi., by Macan (1892). There is also a good translation by G. C. Macaulay (1890).

Heroic Play, a critical term brought into use by Dryden after the restoration. In the *Essays of Heroic Plays*, published with his *Conquest of Granada* (1670), he lays down 'that an heroic play ought to be an imitation in little of an heroic poem, and consequently that love and valour ought to be the subject of it.' Dryden traces the origin of the heroic play to Sir William Davenant. Dryden lays stress on the delineation of elevated character, the taste for which he rightly ascribes to the influence of Corneille and Racine, as the feature which distinguishes the heroic play from the tragedy of Shakespeare and his successors. It is true that, in his earlier *Essay on Dramatic Poesy* (1668), he gives a very similar account of tragedy itself; but Dryden is not a writer from whom to expect great consistency of critical thought. Actually, the distinction of the heroic play from the dramatic types which immediately preceded it depended less upon its ethical content than upon the use of rhymed heroic couplets in its metre. This, again, was a practice borrowed from France. It was introduced by Roger Boyle, Earl of Orrery, author of *The Black Prince* and *Mustapha*. Dryden adopted it in two scenes of *The Rival Ladies* (1663), and made it the regular metre of his most important 'heroic' plays. Those are *Tyrannic Love*, or *the Royal Martyr* (1669); *Almanzor and Almahide*, or *the Conquest of Granada* (1670); and *Aurengzebe* (1675). The vogue of the heroic play received a blow from the witty burlesque of *The Rehearsal* (1671), by the Duke of Buckingham and others; and after the production of *Aurengzebe* Dryden dropped rhyme, returning, in *All for Love* (1678), to a dramatic manner modelled much more closely on Shakespearean tragedy. See W. P. Ker's *Essays of John Dryden* (1900).

Heroic Verse, the name applied to the English rhyming decasyllable, with a well-marked break in the sense after each second line, as distinguished from the form in which the sense overflows from one couplet into another. It was chiefly used by Dryden. See **HEROIC PLAY**.

Héroid, LOUIS JOSEPH FERDINAND (1791-1833), French musical composer, born in Paris; lived at Rome and Naples, but chiefly in Paris. He wrote voluminously, but his reputation rests on three *opéras-comiques*—*Marie* (1826), *Zampa* (1831), *Le Pré aux Clercs* (1833). The overture to *Zampa* has ever since been very popular. See Jouvin's *Héroid*, sa *Vie et ses Œuvres* (1868).

Heron, the name applied to the very numerous species of the genus *Ardea*, which, together with the bitterns (*Botaurus*) and some other forms, make up the family *Ardeidae* of stork-like wading birds (*Ciconiiformes*). Herons are shy birds, solitary during feeding, but breeding in large colonies. They are widely distributed, though most numerous in hot countries. Typical wading birds, they are rarely seen walking on dry ground, and are fond of standing motionless in shallow water on the watch for prey, usually fishes, which are speared with the long beak and then swallowed. In addition to fish, they will eat small mammals, reptiles, amphibians, young birds, insects, and indeed almost any kind of animal food. Herons were formerly protected in Britain, on account of the sport they afforded with falcons. The only species which breeds, though now



Common Heron.

sparingly, in Britain is the common heron (*A. cinerea*). The sexes resemble each other, but the female is smaller, with less bright colours and shorter plumes. The great white heron (*A. alba*), a beautiful bird, which has been much persecuted for the sake of the silvery dorsal plumes, found only in the breeding season, occurs in parts of Europe and in Asia, and is an occasional visitor to Britain. Other species which have been seen in Britain are the purple heron (*A. purpurea*), which breeds freely in Holland; the little egret (*A. garzetta*); the buff-backed heron (*A. bubulcus*); the squacco heron (*A. rallioides*). Related to the true herons is the night-heron (*Nycticorax*), a comparatively small bird, nocturnal in its habits, and usually found in well-wooded districts.

Herondas, or **HERODAS**, an ancient Greek writer of mimes, or scenes descriptive of everyday life; his works were only recovered in 1891 on papyri found in Egypt. He belonged probably to the island of Cos, and is usually

placed in the reign of Ptolemy III. (247-222 B.C.). Editions: Kenyon (1891), Crusius (1892; 3rd ed. 1900), and by J. A. Nairn (1904); trans. in Eng. verse by H. Sharpley (1906).

Herophilus, a physician of antiquity, a native of Chalcedon in Bithynia, and contemporary in the 4th and 3rd centuries B.C. with Ptolemy Soter. Settling at Alexandria, he was one of the first founders of the medical school there, and practised dissection of animals and human bodies. See Marx's *Herophilus* (1838).

Herostratus, an Ephesian who, on the night on which Alexander the Great was born in 356 B.C., set fire to the temple of Artemis at Ephesus, his motive being a desire for notoriety.

Herpes, a disease characterized by small vesicles on the skin or mucous membrane, the vesicles being filled with watery fluid at first, and surrounded by redness. Suppuration may follow, with formation of crusts, which ultimately fall off, in some cases leaving permanent scars. Three special varieties are described. (1.) *Herpes facialis*, in which groups of vesicles appear on the lips, nostrils, ears, or in the buccal cavity. This form causes a little swelling, but is not, as a rule, very painful, and it usually disappears quickly, recovery being hastened by the application of mild antiseptic ointments. *Herpes facialis* is much commoner among children than among adults, in whom its appearance often coincides with the onset of pneumonia. A variety of this form is known as *herpes iris*, or rainbow herpes, from the rings of discoloration surrounding the vesicles. (2.) *Herpes progentialis* appears on the genitals, and is distressing on account of itching. It should be treated by thorough cleanliness and antiseptics. (3.) *Herpes zoster*, *shingles*, or *zona* appears along the course of a cutaneous nerve, the nerves most frequently affected being the intercostals. In most cases it must be regarded as due to a neuritis, which is often of a rheumatic nature. Anæmic and weakly persons are predisposed to the condition, which is characterized by the herpetic eruption and by intense neuralgic pain, with intolerable itching. The vesicles usually persist for about fourteen days, but the pain may precede their eruption, and may continue long after they have disappeared. *Herpes zoster* does not usually recur. Should there be severe inflammation around the vesicles, deep scarring may result. Young people do not usually suffer much, but not infrequently aged patients die of *herpes zoster*, probably from the exhaustion caused by the constant irritation. The treatment

consists in carefully covering the vesicles with cotton-wool, so as to exclude light and air. Absolute alcohol, painted over the vesicles, gives relief, as does a one per cent. cocaine and petroleum ointment. Free dusting with a protective powder, such as boracic acid or talc, and covering with cotton-wool, are often sufficient to give relief; but the more severe cases should be painted with a solution of colloidin or of collodion.

Herrera, FERNANDO DE (c. 1534-97), Spanish poet, born in Seville, chief of the so-called 'Seville' school. His odes, especially in hendecasyllabic metre, are unequalled in the language for grandeur, melody, and profundity. The best is perhaps that on the victory of Lepanto. His elegy on Sir Thomas More is also very fine. His histories, translations of classics, satires, novels are now lost except some of the poems. His sonnets are especially admired as perfect models. The first edition of the poems was issued in Seville (1582), but a larger collection appeared in 1619. His famous commentary on the works of Garcilaso was published in 1580, and raised up many enemies to him in Castile. All his works are printed in Rivadineyra's collection (vol. xxxii.). See Angel Laso de Vega's *Historia de la Escuela Poetica Sevillana* (1876); Morel Fatio's critical ed. of the Lepanto Ode (Paris, 1893).

Herrera, FRANCISCO DE (1576-1636), Spanish painter, called El Viejo (the Elder), to distinguish him from his son, El Mozo (the Younger), was born at Seville. A man of violent temper, he quarrelled with his children and pupils, with Velasquez among others, who learned from him his bold, vigorous touch. Accused of coining false money, he took refuge in the Jesuits' College, Seville, where he painted his famous *St. Hermengild in Glory* (Seville museum), upon which Philip IV. granted him a free pardon.

Herrera, FRANCISCO, THE YOUNGER (1622-85), Spanish painter, born at Seville; fled from his father's cruelty to Rome, and became renowned for his depiction of still life, flowers, fruit, and fish. Returning to Seville, he became sub-director of the Academy under Murillo, painted *The Assumption* in fresco for the Atocha church in Madrid, and was appointed painter to the king. His best picture is perhaps *San Francisco*, in Seville Cathedral.

Herrera y Tordesillas, ANTONIO DE (1549-1625), Spanish historian, born at Segovia; was appointed by Philip II. historiographer-royal. His principal works are *Historia General del Mundo*

del Tiempo del Señor Rey Don Felipe II. (3 vols. 1601-12), and *Historia General de los Hechos de los Castellanos en las Islas y Tierra Firme del Mar Oceano 1492-1554* (4 vols. 1601-15).

Herreshoff, NATHANIEL GREENE (1848), American yacht designer, born at Bristol, Rhode Island. He has designed numerous vessels, including torpedo boats. He also designed the *Vigilant*, *Defender*, *Columbia*, and *Reliance*, winners of the international yacht races for the America Cup.

Herrick, ROBERT (1591-1674), English poet, was son of a London goldsmith. He joined the band of young wits and poets who clustered round Ben Jonson, but must have taken orders before 1627, when he acted as chaplain to an expedition to the Isle of Rhé. In 1629 he took the country vicarage of Dean Prior, in Devonshire. His best verses show the influence, partly of Ben Jonson, but far more of the Latin poets. He looks at country life and ways, at flowers and at folklore, with the eyes of a renaissance idyllist. His divine poems are not without religious feeling, but his wholly secular and erotic ones ring more true. He has also a turn for epigrams in the vein of Martial. But his exquisite lyric quality is undeniable. Either his royalist sympathies or his unclerical interests lost him his living in 1647. After the restoration, in 1662, he returned to Dean Prior, and died there. Complete Works—ed. by W. C. Hazlitt (1869), and by Dr. Grosart (1876). Poems—*Hesperides*, with *Noble Numbers* (1648). Collected Poems—ed. A. W. Pollard (1891); ed. G. Saintsbury (1893); ed. L. Magnus (1899), etc. Selections—*Chrysomela*, ed. F. T. Palgrave (1877).

Herries, SIR JOHN MAXWELL, FOURTH LORD (1512-83), was the second son of Robert, fifth Lord Maxwell. Although a supporter of the reformed party and a special friend of Knox, he cast in his lot with Queen Mary. After Carberry he was entrusted with the chief management of her cause, and though, on the accession of Moray to the regency, he became ostensibly reconciled to him, he engaged in the Lochleven plot, and fought for the queen at Langside. He was concerned in the scheme for depriving Morton of the regency in 1578; and after Morton's execution in 1581 he allied himself closely with the schemes of Lennox on behalf of the queen. He died suddenly. His own version of much of his political conduct is given in his *Historical Memoirs*, printed by the Abbotsford Club in 1836.

Herring (*Clupea harengus*), sea-fish belonging to a family which includes also the pilchard, sprat, anchovy, and the shad. In the dark and middle ages the her-



Herring.

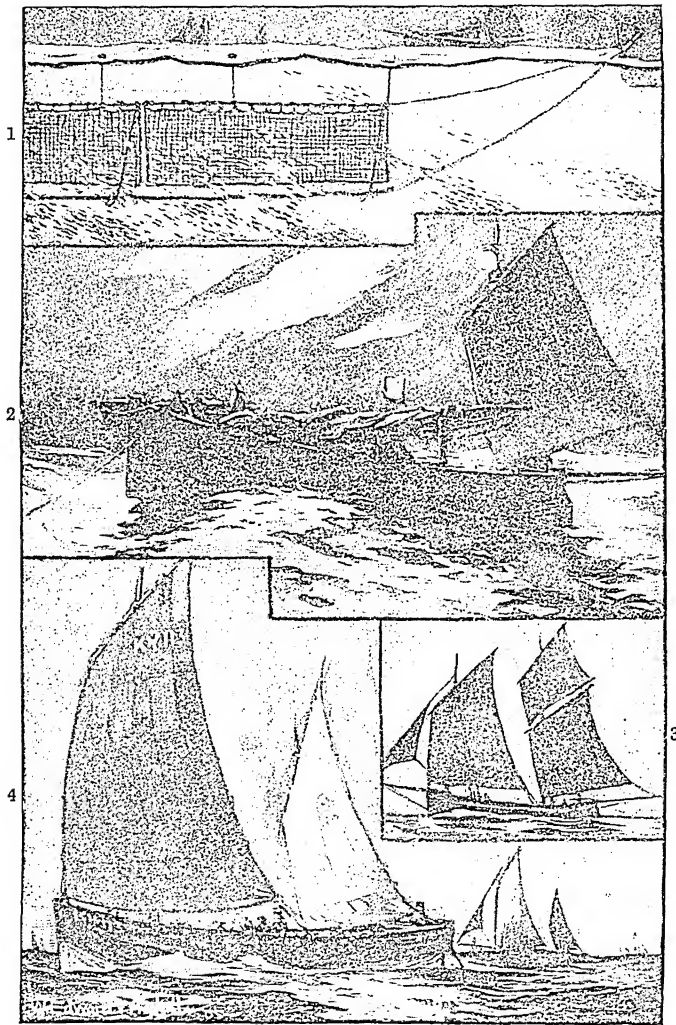
ring fishery was the most important in Western Europe, its principal centres being Scania—the southern provinces of modern Sweden—and the east coast of Britain, especially Norfolk, where the great Dutch fishery was carried on. The commerce in salted and smoked (red) herrings was in part the source of the wealth of the Hanseatic towns and of the Dutch.

All the members of the herring family are 'surface' or 'migratory' fishes, swimming in shoals, usually in mid-water or near the surface, and feeding principally on minute organisms, especially Crustacea, which they strain from the water by means of the sieve-like arrangement of the gill-rakers, much in the same manner as the whalebone whales obtain their food. The herring, however, also lives upon pelagic worms (*Sagitta*), and at certain seasons on its own young, young sprats, and young sand-eels. It may be distinguished from the sprat, which used to be confounded with it, by the pelvic fins being placed a little behind the commencement of the dorsal fin, while in the sprat they are a little in front, and by the comparatively weak serration of the edge of the belly, the serration in the sprat being very sharp. The eggs, which are demersal and adhesive, are deposited on stones, gravel, seaweed, etc., on the bottom, usually near the shore in moderately deep and shallow water. The number of eggs deposited by a female ranges from about ten to over sixty thousand, according to her size, the mean number being about thirty-one thousand; and the time taken for the embryonic fish to hatch out varies with the temperature from eight or nine to over forty days. At the end of one year they are about five inches in length, and they attain maturity when seven or eight inches long, at two or three years of age.

The movements or migrations of the herring are still imperfectly understood. The view commonly held is that the herrings, when the shoals break up at the end of spawning, simply disperse into the neighbouring sea; but many facts show that they may move considerable distances. The herring occasionally deserts a

spawning ground for reasons not well understood. The Bohus fishery in Sweden is the most notable instance, the fishery being subject to barren epochs. This fish is found all over the North Sea, in the North Atlantic as far south as lat. 37° N., on both the American and European coasts, in the Norwegian Sea, the White Sea,

the Shetlands to Norfolk, during the months June to December, by British, Dutch, German, French, and Belgian fishermen. There is also a much less important and more variable winter or spring fishing at certain parts of the coast, as off Ayrshire, in the Firth of Forth, and the Moray Firth. The drift-net is mostly employed.



Herring-Fishing.

1. Position of herring net. 2. Yarmouth herring smack with nets down. 3. Penzance herring boat. 4. Scottish herring boats.

and the Sea of Japan. It is absent from the Mediterranean. A closely allied form (*C. pallasii*) is abundant in the Pacific from Alaska to Mexico. The herring is perhaps most numerous around the British Isles, and the greatest of all herring fisheries is prosecuted along our east coast from

For some time steam vessels have been largely employed in herring drifting. Seine-nets are used in narrow waters, particularly in Loch Fyne and the Clyde. Of late years herring-fishing has been greatly developed in Scotland, and is carried on at the Hebrides or Scrabster in May, at

the Shetlands in May and June, along the east coast until the end of September. About eighty per cent. of the herrings are cured, either as salted, kippered, tinned, or reds. See Caux's *Herring and Herring Fishery* (1882).

Herrmann, WILHELM (1846), German Protestant theologian, born at Melkow, near Magdeburg. He began to lecture at Halle in 1874, and was called to the chair of dogmatics at Marburg in Hesse in 1879. His principal works are *Die Metaphysik in der Theologie* (1874); *Die Religion im Verhältniss zum Welterkennen und zur Sittlichkeit* (1879); *Der Verkehr des Christen mit Gott* (1886; 4th ed. 1903; trans. in Theol. Trans. Library, 1895); *Christliche Ethik* (1901); *Faith and Morals* (1904), comprising two smaller works. Having been much influenced by Ritschl, Herrmann has developed that master's distinction between theoretical (or scientific) and religious truth to the breaking point, and is one of the most impressive and sincere advocates of an independent, non-metaphysical Christian theology.

Herrnhut, vil. in kingdom of Saxony, 35 m. by rail S.E. of Bautzen; the cradle of the Herrnhut sect, a branch of the Moravian Brethren, founded here in 1722. Pop. (1900) about 1,200.

Herschel, div. and tn. in Cape Colony. The district is bounded on the N. by the Orange R., and covers about 800 sq. m. The town lies 30 m. E. of Aliwal N. Pop. 25,000.

Herschel, CAROLINE LUCRETIA (1750-1848), astronomer, sister of Sir William Herschel, was born at Hanover. Coming to England (1772) to live with her brother at Bath, she helped him in his astronomical researches, and, when he was appointed astronomer-royal, acted as his assistant. She discovered eight comets between 1786 and 1797, and many of the smaller nebulae and star clusters included in Sir William Herschel's catalogue, and published (1798) for the Royal Society a catalogue of stars taken from Flamsteed's observations. After her brother's death (1822) she returned to Hanover. See Mrs. Herschel's *Memoir and Correspondence of C. L. Herschel* (1876).

Herschel, SIR JOHN FREDERICK WILLIAM (1792-1871), English astronomer, son of Sir William Herschel, was born at Slough, Buckinghamshire; studied at St. John's College, Cambridge, where he graduated senior wrangler and Smith's prizeman (1813). In 1816 he translated Lacroix's *Elementary Treatise on the Differential Calculus*, with an appendix on *Finite Differences*, which was succeeded in 1820 by two volumes of *Examples*, in collaboration with

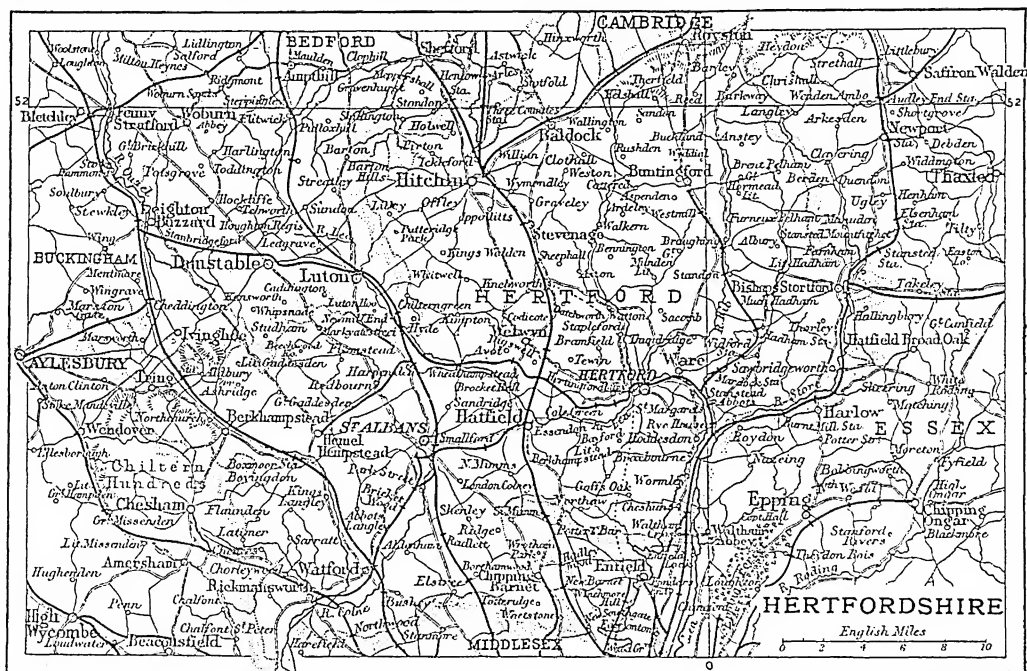
Babbage. Herschel became Copley medallist in 1821, and worked with Sir James South on a re-examination of his father's star catalogues. In 1834 he established an observatory at Feldhausen, near Cape Town, and examined the southern heavens for four years, discovering 1,202 pairs of close double stars and 1,708 clusters and nebulae. He was made master of the Mint (1850-5). His miscellaneous writings were published as *Essays* (1857) and *Familiar Lectures on Scientific Subjects* (1867). He invented the photographic use of sensitized paper, and discovered the use of hyposulphite of soda as a fixing agent, and made valuable researches on

Places of 145 New Double Stars. He discovered two of the satellites of Saturn, the rotation of its rings, and the periods of rotation of Saturn and Venus, the binary stars, the constitution of nebulae, and added greatly to our knowledge concerning the Milky Way. In 1789 he erected his famous telescope of forty feet focal length. He received the Copley medal from the Royal Society (1781). See Holden's *Herschel's Life and Work* (1881), Clerke's *The Herschels* (1895), and Sime's *William Herschel and his Work* (1900).

Herschell, Sir Farrer Herschell, Baron (1837-99), Lord High Chancellor of Great Britain,

Herstal, or HERISTALL, tn., Belgium, 2 m. N.E. of Liège, of which it is a suburb. It stands on the Meuse, and manufactures firearms. Herstal is the reputed birthplace of Pippin le Gros. Pop. (1900) 18,322.

Hertford, munic. bor., cap. of Hertford co., England, on the Lea, 21 m. N. of London. The church of All Saints replaced the older church burned in 1891. Hertford Castle was the last residence of Isabella (1292-1358), widow of Edward II., and was the prison of John, king of France, and David Bruce, king of Scotland. Rebuilt about a hundred and fifty years ago, it is now a private residence. Two miles dis-



the undulatory theory of light. Ten editions of his *Outlines of Astronomy* were published (1849-69).

Herschel, Sir William (1738-1822), astronomer-royal, was born at Hanover. Educated as a musician, he came to England (1757), teaching music in Leeds, Halifax, and Bath, where he held the post of organist. Turning his attention to astronomy, with the help of his sister he constructed a telescope for himself, and in 1781 discovered a new planet, the Georgium Sidus (afterwards named Herschel), and several of its satellites. This led to his becoming private astronomer to George III. From Bath he went to live at Slough. In 1783 he wrote his *Motion of the Solar System in Space*; also a paper, *On the*

was born at Brampton, Hampshire; was called to the bar (1860), and appointed q.c. (1872). He was recorder of Carlisle (1873-80), M.P. for Durham (1874-85), solicitor-general (1880-5). Raised to the peerage (1886), he sat on the woolsack from February to July of that year, and again in the Liberal administration (1892-5). While at Washington on the Anglo-Venezuelan Arbitration Commission in 1898, he met with an accident, from which he died in February following.

Hersfeld, tn., Prussian prov. of Hesse-Nassau, on the Fulda, 26 m. by rail N. of Fulda. From 769 down to 1648 it was the seat of a famous Benedictine abbey. Manufactures cloth, cotton goods, and leather. Pop. (1900) 7,908.

tant is Haileybury College. Pop. (1901) 9,322.

Hertfordshire, or HERTS, inland co. of England, N. of Middlesex. The surface is undulating and varied, traversed by chalk ridges continuous with the Chiltern Hills, and diversified with numerous private parks, which give a special character to the landscape. It is drained chiefly to the Thames by the Colne and the Lea. The New R., an artificial channel constructed (1608-13) to supply N. London with water, is fed by springs at Amwell and Chadwell, near Hertford. Branches of the Grand Junction Canal afford water communication. Agriculture is the principal industry, and market gardening is important. Manufac-

tures include the making of straw-plait, bricks and tiles, sail-cloth, silk, paper. There are also corn mills and tanneries. Hertfordshire returns four members to Parliament. Watling, Ermine, and Ikniold Streets cross the county. Near St. Albans was the Roman *Verulam*, and at Wilbury Hill is an ancient camp. Area, 636 sq. m. Pop. (1901) 250,350.

Hertogenbosch, 's, also 'sBosch and Bois-le-Duc, chief tn. of the prov. of N. Brabant, Netherlands, 30 m. by rail S.E. of Utrecht; possesses a fine 15th-century cathedral. Down to 1876 the town was strongly fortified; it was a bishop's see from 1559 to 1645. Pop. (1899) 30,517.

Herts. See HERTFORDSHIRE.

Hertz, HEINRICH RUDOLF (1857-94), German physicist, born in Hamburg; died at Bonn, where he had been professor of physics for five years. He received his final training in experimental and mathematical physics in Berlin under Von Helmholtz. It was during his tenure of the professorship in Karlsruhe technical high school (1885-9) that he made his remarkable experiments on electric waves, the existence of which formed the central feature of Maxwell's profound theory of electricity and magnetism. The great advance made by Hertz was the experimental demonstration of the existence of electromagnetic waves of comparatively slow frequency. This he did by inventing what might be called an electric eye—i.e. an apparatus sensitive to the passage of these Hertzian waves, just as our eye is sensitive to the passage of waves of light. Resonance formed his guiding principle. Kelvin had shown under what conditions an electric discharge was oscillatory in character, and Hertz showed how to make an instrument in tune with this oscillation—in fact, an electric resonator which could pick out and make evident the appropriate electric disturbance, just as the Helmholtz resonator picks out the appropriate note and makes it distinctly audible to the ear. Having proved the existence of electric waves propagated through space, he showed that they could be reflected, refracted, polarized, and diffracted, just as light is. He measured the velocity of propagation, and found it to be of the same order as that of light and radiant heat. Wireless telegraphy is the practical development of the experimental facts established by Hertz, and gives to the Hertzian waves an added importance. From this point of view his discoveries rank with Faraday's discovery of the induction of currents. Hertz also wrote valuable memoirs on dif-

ficult problems in elasticity, and published shortly before his death a profound treatise on the foundations of dynamics. All his important writings (*Gesammelte Werke*, 3 vols. 1894) have been translated into English by D. E. Jones, as *Electric Waves* (1893; 2nd ed. 1900), *Miscellaneous Papers* (1896), and *Principles of Mechanics* (1899). See Oliver Lodge's *Hertz and his Work* (1895).

Hertz, HENRIK (1798-1870), Danish author, born at Copenhagen of Jewish extraction, but became a Protestant. As a poet he belongs to Heiberg's school. His *Gjengangerbreve* (1830) is one of the best satires in the Danish language, and his many vaudevilles (e.g. *Amors Genistregjer*) are scarcely inferior to those of his master, Heiberg. His romantic drama, *Kong René's Datter* (1845), has been translated into English by Sir Theodore Martin (1850; now ed. in verse, 1894). Another work of capital importance and high artistic excellence is the drama *Svend Dyrings Hus* (1837); while his *Flyttedagen* and *Sparekassen* (1836) are each in its way noteworthy. Hertz's *Samlede Skrifter* appeared in 13 vols. (1854-73).

Hertzian Waves. See HERTZ, and ELECTRO-MAGNETIC WAVES.

Heruli, a Teutonic nation, who, in the 5th century A.D., invaded the Roman empire, and, under the command of Odoacer, put an end to the Western Roman empire in 476 A.D.

Hervé, FLORIMOND RONGER, (1825-92), French musical composer, librettist, actor, manager, born at Houdain, near Arras, and popular in England as conductor at the promenade concerts (Covent Garden, 1874, and the Empire). He was part composer of the once familiar *Babil et Bijou*, but is, perhaps, heard at his best in *L'Œil Crevé* (1867), *Chilpéric*, and *Le Petit Faust* (1869).

Hervey, ARTHUR (1855), British musical composer and musical critic, born at Paris; was musical critic of *Vanity Fair*, then of the *Morning Post* (1892), and author of *Masters of French Music* (1894), which deals with the 19th-century composers, and 'the tendencies exhibited in their works'; and *French Music in the 19th Century* (1903). His short musical works are for piano and strings, and also many songs to English and foreign words. His descriptive ballade, *The Gates of Night*, was favourably received at the Gloucester festival (September 1901), as were his dramatic overture, *Youth*, at the Cardiff festival (1902), *Two Tone Pictures*, at the Gloucester festival (1902), and *In the East*, a tone poem, at the Cardiff festival (1904).

Hervey, JAMES (1714-58), English religious writer, born at Hardingstone, near Northampton; succeeded to the family living of Weston Favell (1752). His chief work, *Meditations among the Tombs* (1745), which includes 'Meditations among the Tombs,' 'Meditations in a Flower Garden,' 'Meditations on Creation,' 'Contemplations on the Night,' 'Contemplations on the Starry Heavens,' and 'The Winter Piece,' is evangelical in tone, and full of the love of nature. His Calvinistic *Dialogues between Theron and Aspasio* (1755) provoked the active opposition of John Wesley, among others. See Dr. Birch's *Life of Hervey*, prefixed to his *Letters* (1782).

Hervey Islands. See COOK ISLANDS.

Hervieu, PAUL ERNEST (1857), French novelist and dramatist, born at Neuilly-sur-Seine; in 1882 published his first book, *Diogène le Chien*, which attracted attention by its originality and charm of style. This was followed by *La Bêtise Humaine* (a collection of newspaper 'chroniques,' 1884), *Flirt* (1890), *Peints par eux-mêmes* (1893), and *L'Armature* (1895). He is the author of the plays, *Point de Lendemain* (1890), *Les Paroles Restent* (1892), *Les Tenaillles* (1894), *La Course du Flambeau* (1901), *L'Enigme* (1901), *Théroigne de Méricourt* (1902), and *Le Dédale* (1903). He was elected to the French Academy in 1900. As a novelist, he blends a keen observation of life with a delicate fancy which delights in the unusual.

Herwarth von Bittenfeld, KARL EBERHARD (1796-1884), Prussian general, born at Grosswerther in Thuringia; acquired considerable reputation during the later Napoleonic wars, especially at Leipzig; and again in the Schleswig-Holstein campaign, by the conquest of the Isle of Alsens. In 1866, he directed the occupation of Saxony, also the invasion of Bohemia, and took a leading part in the Austrian defeats of Hühnerwasser, Münchengrätz, and Königgrätz. In 1871 he was made field-marshal.

Herwegh, GEORG (1817-75), German lyric poet, born at Stuttgart; published *Gedichte eines Lebendigen* (1841), which, being republican or Liberal in tendency, were extremely popular. He joined the Radical party in Paris in 1845; two years later he raised a German democratic legion for the invasion of Baden, intending to establish a revolutionary government there, but failing in his attempt, fled to Switzerland. He translated Lamartine's *Complete Works* (12 vols. 1843-4), and several plays of Shakespeare.

Herz, HEINRICH (1806-88), known as Henri Herz, musical composer, born of Jewish parentage at Vienna; spent most of his life in Paris. As a piano virtuoso and teacher he enjoyed the highest reputation, and in 1842 became professor at the conservatoire. He founded a famous manufactory for pianos, and also a concert hall in Paris. His numerous works—arrangements for piano, etc.—are now out of sale, excepting, perhaps, his *Etudes*.

Herz, HENRIETTE (1764-1847), daughter of a Jew of Portuguese extraction, whose real name was Lemos. She was born in Berlin, and, owing to her beauty and her intellectual gifts, succeeded in making her house in Berlin the resort of such men as the Humboldts, Börne, the Schlegels, and Fichte. She was especially intimate with Schleiermacher, whose philosophical ideas she shared. In 1817 she became a Christian. See *Life*, in German, by Fürst (2nd ed. 1858).

Herzegovina, prov. of the Ottoman empire, but administered since 1878 by Austria, is a mountainous region, watered by the Neretva, and lying between Bosnia, Servia, Montenegro, and Dalmatia. Its conformation is the same as that of Bosnia; but its elevations are higher, and its climate generally a little severer. Barley, tobacco, and fruits are the principal cultivated products; but one-half of the surface is covered with forest. Area, 3,520 sq. m. Pop. (1895) 219,511, of whom over one-third are Mohammedans. Chief town, Mostar.

Herzen, ALEXANDER (1812-70), Russian author and publicist, born at Moscow. In 1834 he was exiled to Siberia because of his too liberal political views, but returned to Moscow in 1842, and wrote novels of a social and political character. He left Russia (1846), and eventually established (1851) a printing press in London to advocate the cause of reform in his own country. Thence his two periodicals, the *Polar Star* and the *Bell* (*Kolokol*), were smuggled into Russia in thousands. Later on, when Herzen espoused (1863) the cause of Poland, he lost all influence with his countrymen. He edited the works of Pushkin, Lermontov, and other Russian writers, and his own works (Russian) appeared in 10 vols. (1875-85) at Geneva. He frequently used the pseudonym of 'Iskander.' In English he appeared his *My Exile to Siberia* (1855) and *Memoirs of the Empress Catherine II.* (1859). See O. von Sperber's *Die sozial-politischen Ideen A. Herzens* (1894).

Herzl, THEODOR (1860-1904), Jewish political leader, and founder of the Zionist move-

ment, was born at Budapest; he was long on the staff of the Viennese *Neue Freie Presse*. In 1896 he produced *Der Judenstaat* (5th ed. 1903), in which he advocated the founding in Palestine of an autonomous Jewish state under the suzerainty of Turkey.

Herzog, JOHANN JAKOB (1805-82), German Protestant theologian, born at Basel; was professor of theology successively at Halle (1847) and Erlangen (1854); the author of books on *Calvin* (1843), the *Waldenses* (1853), *Abriss der Gesamten Kirchengeschichte* (4 vols. 1876-87; new ed. 1890-2); but his principal work was the excellent *Realencyklopädie für Protestantische Theologie und Kirche*, in 22 vols. (1853-68), a 2nd ed. of which, in collaboration with Plitt, appeared in 18 vols. (1877-88), and a 3rd ed. by Hauck (1896, *et seq.*). The English abridged edition is by Schaff (3 vols. 1882-7).

Heshbon (Num. 21:25, etc.), a city of the Amorites, on the plateau above the N.E. corner of the Dead Sea, Palestine.

Hesiodus, commonly called Hesiod, is, after Homer, the most famous of the early poets of Greece. The ancients usually considered him and Homer as contemporaries; but it is certain that Hesiod lived long after Homer. Herodotus's date for Hesiod (about 860 B.C.) would seem to be tolerably accurate, though many authorities date him about 750 B.C., or even later. Hesiod's father migrated from Cume in Asia Minor to Ascræ in Boeotia, where Hesiod was born. Later, Hesiod is said to have removed to Orchomenus, and to have died there; there, at any rate, his tomb was shown in later days, though Thucydides mentions a tradition that he was killed in the temple of Nemean Zeus at Cnecra in Locris by the inhabitants of the place. The story that he and Homer had a contest for the prize of poetry is amply disproved by their difference in dates. He has left us only two poems which can be considered genuine—the *Works and Days* and the *Theogony*—though the authenticity even of the latter is suspected by some critics. The *Works and Days* is the earliest didactic poem known to us in Greek. Its subject is the right methods of husbandry, the due observance of the proper seasons, and a sort of calendar; it contains many precepts on household management, commerce, the choice of a wife, navigation, and the education of children. Yet there is poetry in various episodes in the work—viz. the fable of Prometheus and Pandora, the account of the different ages of the world, and a description of winter. There is

also much vigour of thought and expression in the many moral and political maxims in which the work abounds. The *Theogony* narrates the creation of the world, the ocean, earth, heaven, stars, and gods; and the genealogy of the gods. A third work, the *Shield of Heracles*, is usually included in editions of Hesiod; but it is certainly not genuine, and is an inferior imitation of the description of the shield of Achilles in the *Iliad*. Hesiod is especially interesting as the earliest known spokesman of the lower classes, the toiling labourers of earth; he expresses their grievances, and bemoans their hard fate. It is his metre and the use of the epic dialect alone that caused him to be classed with Homer. Editions: Goettling and Flach (1878); Paley (2nd ed. 1883); Sittl (1889); English trans. (verse), by C. A. Elton (1832); (prose), by J. Banks (1856)—both in Bohn's Series. See W. F. Cornish's *A Study on Hesiod* (1893).

Hesione, a daughter of Laomedon, king of Troy. Her father exposed her chained to a rock to deliver the land from a plague and a monster sent by Poseidon and Apollo, and Hercules rescued her, on condition of receiving the horses given to Laomedon by Zeus. As the condition was not fulfilled, Hercules took Troy, and gave Hesione to Telamon.

Hesperia. See **HESPERUS**.

Hesperides, the daughters of Hesperus, were in Greek mythology the guardians of the golden apples given by Ge to Hera on her marriage with Zeus. The earliest legends make them dwell on the river Oceanus in the farthest west; other accounts associate them with the giant Atlas, and place them on Mount Atlas.

Hesperornis, a fossil bird of the Cretaceous system, which had teeth in the jaws similar to those of reptiles. *Hesperornis* is in a sense a degenerate type. The fore limbs have never been discovered, and must have been absent or quite rudimentary in the living animal. The absence of the carina or keel in the breast-bone shows that *hesperornis* had lost the power of flight. The structure of the feet indicates an aquatic habitat. The remains of *hesperornis* are found in the upper Cretaceous rocks of Kansas; and the average height of the living animals must have been about three feet.

Hesperus (Lat. *Vesper*), the Greek name of Venus as the evening star, was identified with the morning star both by Homer and Hesiod, under the name of Phosphorus (Lat. *Lucifer*). The Greek poets called Italy *Hesperia*, and the Latin poets applied the name to Spain.

Hess, PETER VON (1792-1871), German historical painter, born at Düsseldorf, and at first painted scenes and incidents in the Napoleonic campaigns of 1813-15 (in which he fought), as *The Battle of Arcis-sur-Aube* (1817). In 1833 he accompanied King Otho to Greece, and painted *King Otho's Entrance into Nauplia* (now in the Pinakothek at Munich). Six years later the Russian Czar invited him to St. Petersburg and Moscow, and there he executed eight large pictures dealing with Napoleon's campaign of 1812. Subsequently he painted, in the Hofgarten at Munich, thirty-nine frescoes depicting scenes of the Greek war of independence. His works are characterized by excellent composition and beautiful colouring.

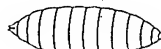
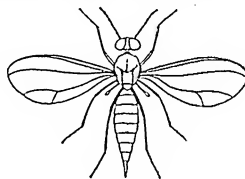
Hesse - Darmstadt, grand-duchy of Germany, consists principally of two separate portions of territory—(1) Upper Hesse, on the N. side of the Main; and (2) Rhenish Hesse and Starkenburg, on the S. side of the Main, but divided from each other by the Rhine. The S.E. of Starkenburg is filled by the Odenwald, and the E. of Upper Hesse in part by the volcanic Vogelsgebirge (2,500 ft.). The valley of the Rhine and the Wetterau in Upper Hesse are both districts of great fertility. Wine is one of the principal products. Forests cover nearly one-third of the surface. There is considerable manufacturing industry—iron works, factories for machinery, vehicles, leather goods, chemicals, furniture, tobacco, boots and shoes, hats, soap, matches, sausages, sugar, beer, spirits, wooden wares. There are mineral springs at Nauheim and elsewhere. There is a university at Giessen. Area, 2,965 sq. m. Pop. (1900) 1,119,893. Capital, Darmstadt. Hesse-Darmstadt owes its foundation to the first landgrave, George (1567-96). It was made a grand-duchy in 1806, but in 1866 was compelled to yield a large slice of territory to Prussia.

Hesse-Homburg, former landgraviate of Germany, composed of the district of Homburg vor der Höhe and that of Meisenheim, on the r. and l. bks. of the Rhine respectively. Area, 106 sq. m. Since 1866 it has belonged to Prussia. Its chief town was Homburg. Pop. (1864) 27,374.

Hesse-Kassel, a former electorate of Germany, coinciding generally with the circle of Kassel in the existing province of Hesse-Nassau, had an area of 3,716 sq. m., and a population (1864) of 745,063. It was founded (a landgraviate) in 1567 by Landgrave William IV. From the middle of the 18th century the landgraves

of Hesse-Kassel were wont to hire out their subjects as mercenary soldiers, in great part to Great Britain. In 1803 Landgrave William IX. was granted the rights of an elector of the empire; but in 1807 he was compelled to transfer nearly all his territories to the new kingdom of Westphalia, of which Kassel was chosen as the capital. He recovered them, however, in 1813, but in 1866 they were seized by Prussia.

Hesse-Nassau, prov. of Prussia, between the Rhine and the Weser, surrounds on all sides the district of Upper Hesse, belonging to Hesse-Darmstadt. The surface is mostly hilly, and includes the Taunus (1,500-2,900 ft.), the Westerwald (1,000-2,160 ft.), and the Hessian Bergland (1,200-2,500 ft.). It is drained by the Rhine, Main, Lahn, Fulda, and Werra. Wine is the principal product, the Rheingau yielding several of the most valuable brands of Rhenish. Fruits and vegetables are largely grown. The Taunus region is famous for its mineral waters (Wiesbaden, Ems, Homburg, Schlungenbad, Soden, etc.). Forests cover two-fifths of the surface. There is a good deal of manufacturing industry—iron works, engineering, gold and silver ware, instruments, leather goods, chemicals, tobacco, and stone-ware factories. Area, 6,058 sq. m. Pop. (1900) 1,897,981. Capital, Kassel. This province was formed in 1867-8 out of the electorate of Hesse-Kassel, the duchy of Nassau, the territory of Frankfort-on-Main, the landgraviate of Hesse-Homburg, and other areas of country.



Hessian Fly: imago, larva, and pupa.

Hessian Fly, a gall-midge (*Cecidomyia destructor*) supposed—apparently erroneously—to have been introduced into North America by the Hessian troops at the time of the war of Independence. The adult female is a small fly with hairy legs, under one-tenth of an inch in length, and of a velvety black colour, with blood-

red markings. The male is larger and rather different in colour. During April the two sexes enjoy their brief period of aerial life, and then die. The eggs are laid on leaves of wheat, and the larvæ, as soon as hatched, crawl down to the stem and burrow in it. Here they spend the whole of their larval and pupal life, the summer brood of flies emerging at the end of August or the beginning of September. These again pair, and a fresh supply of eggs is laid on winter wheat, the resulting larvæ passing the winter in the pupal stage, and giving rise to the spring brood of flies. Both sets of larvæ are very destructive to wheat, the autumn brood especially so; even if the death of the wheat plant does not result from their attacks, the stem is weakened so that the corn is easily 'laid,' and the yield is greatly diminished. An allied form is the wheat midge (*Cecidomyia Tritici*), which attacks the inflorescence of the wheat plant, and partially or entirely prevents the setting of seed. See E. A. Ormerod's *The Hessian Fly* (1886).

Hestia, called Vesta by the Romans, was one of the twelve chief divinities of ancient Greece; she was the daughter of Cronos and Rhea. She was the goddess of the hearth, or more particularly the fire on it, as representing the centre of domestic life. She was considered to preside at all sacrifices, and the first part of every sacrifice was offered to her. Every town and state had also its central hearth, which was sacred to her, and at which her worship was performed. If this fire ever went out (though great care was always taken to keep it alight), it might not be rekindled with ordinary fire, but only by the sun's rays, or by the friction of two pieces of wood.

Heston and Isleworth, suburb of London, Middlesex, England, 12 m. S.W. of St. Paul's, is a residential quarter, and has market gardens. Pop. (1901) 30,838.

Hesychasts, monks or recluses, literally 'quietists,' in the Eastern Church, who thought that by protracted contemplation they came to see the 'Taboritic light,' or the divine light that shone on Mount Tabor.

Hesychius, Greek grammarian of Alexandria, who lived probably during the 4th century A.D. His only extant work is a dictionary, which is of great value not only for its explanations of existing words, but also as a collection of words otherwise unknown, and as a storehouse of quotations from lost works. Edition, Alberti and Ruhnken (1746-66). See Ranke's *De Lexici Hesychiani vera Origine et Genuina Forma Commentatio* (1831).

Hetairai, in ancient Greece, and particularly at Athens, courtesans of the best class. They were often trained to play the flute or the lyre, or to dance; some studied philosophy, like Lasthenia, the pupil of Plato, and Leontion, who was a hearer of Epicurus; but the most famous of all for her intellectual powers was Aspasia, the mistress of Pericles, who associated also with Phidias and Anaxagoras. The most famous of the hetairai besides those mentioned are Lais, Phryne, Pythionice, and Theodote, whom Socrates (in Xenophon's *Memorabilia*) visited. Corinth especially was famous for the numbers of such girls it contained.

Heterocercal, a name applied to the tail of fishes and other aquatic vertebrates when the vertebral column is bent upwards at its tip, and the ventral part of the tail fin is smaller than the dorsal part, and is some little distance behind it. Such tails are found in living elasmobranchs and in some ganoids. They are associated with a ventral mouth, and their effect is to drive the head downwards at each stroke, the food in such cases being usually obtained from above. In certain fossil reptiles the tail was also heterocercal, or unequally lobed; but in their case the lower was the larger lobe, the effect being to drive the head upwards at each stroke—a peculiarity associated with the necessity of rising frequently to the surface to breathe. The common sturgeon affords a good example of a heterocercal tail. Compare HOMOCERCAL.



Heteropoda (Atlanta Peronii).

Heteropoda are gasteropod molluscs adapted for a pelagic life. The foot is not used for crawling, but, being laterally compressed, serves as a fin, and also as a means of attaching the body to the prey or to floating bodies. A shell is sometimes present and sometimes absent, the sexes are separate, the diet carnivorous. The animals are inhabitants of all the warmer oceans. Examples are the species of *Carinaria* and of *Atlanta*; the former have beautiful cup-shaped shells.

Heteroptera, a sub-order of hemipterous insects, as contrasted with the other sub-order

of Homoptera. In the Heteroptera the anterior wings are more horny than the posterior. It is especially the basal portion of the fore wings which is thickened and horny, the apical part being more membranous. In repose the wings lie flat on the back, whereas in Homoptera they meet in a rooflike manner over the abdomen. Some are handsome and showy forms, while others, such as the bed-bug, are as repulsive in appearance as in habits. Other examples are the water scorpion (*Nepa cinerea*), the water boatman (*Notonecta glauca*), and the pretty though evil-smelling bishop's mitres, such as *Asopus luridus*; all these occur in Britain.

Hetman, or ATAMAN, title of the chief army officer of the Cossacks; generally applied also to a Cossack chieftain.

Hettner, HERMANN JULES THEODOR (1821-82), German *littérateur*, was born at Leyersdorf, Silesia, and was appointed professor of aesthetics at Jena, and afterwards director of the Museum of Antiquities at Dresden. Among his works are *Vorschule zur bildenden Kunst der Alten* (1848), *Die romantische Schule* (1850), *Das moderne Drama* (1852), *Griechische Reiseskizzen* (1853), and *Literaturgeschichte des 18. Jahrhunderts* (1856).

Hetton-le-Hole, par., Durham, England, $5\frac{1}{2}$ m. N.E. of Durham; has numerous coal mines. Pop. (1901) 13,673.

Hettstedt, tn., Prussian prov. of Saxony, 27 m. by rail N.W. of Halle; produces silver and copper. Pop. (1900) 8,924.

Heuglin, THEODOR VON (1824-76), German African traveller, born at Hirschlanden in Württemberg. He made explorations in Egypt, Abyssinia, the Sudan, Somaliland, and Central Africa. In 1863 he shared in the Tinné expedition, and in 1870 journeyed to the Polar regions, and discovered King Charles Land. Nearly every one of his journeys was separately described. See *Petermann's Mitteilungen* (1861-4).

Hevelius, or HÖWELKE, JOHANNES (1611-88), German astronomer, born at Danzig, where he lived and died. In 1641 he erected an observatory in his own house, furnished it with large telescopes constructed by himself, and devoted his time to making astronomical observations, the results of which he embodied in his *Selenographia* (1647), *Cometographia* (1668), *Machina Caellestis* (1673-9), and other works. He was elected a member of the English Royal Society in 1664. In 1690 was published his *Prodromus Astronomicæ*.

Heves. (1.) Comitatus of Hungary, between the Danube and

the Tisza (Theiss), is crossed in the N. by the Matra Mts., but in the S. belongs to the great Hungarian plain. It yields lignite, agricultural products, fruit, wine, and tobacco. Area, 1,468 sq. m. Pop. (1900) 253,368. Chief tn. Eger (Erlau). (2.) Town, Hungary, chief tn. of above co., 80 m. by rail E. of Budapest; grows good water-melons. Pop. (1900) 7,978.

Hewins, WILLIAM ALBERT SAMUEL (1865), English writer on economic science, born in Staffordshire; professor (1897) of economic science at King's College, London; director of the London School of Economics and Political Science, affiliated to the reorganized University of London, in which he was recently a teacher and examiner in political economy. In 1903 he became secretary of the Tariff Commission, and wrote and lectured actively in support of Mr. Chamberlain's policy. He has published *English Trade and Finance in the 17th Century* (1892), *Imperialism* (1901).

Hewlett, MAURICE HENRY (1861), English novelist, born at Shaw Hill, Addington, Kent; was keeper of Land Revenue Records and Enrolments (1896-1900). Among his works the chief are *Earthwork out of Tuscany* (1895; 3rd ed. 1901); *Songs and Meditations* (1897); *The Forest Lovers* (1898); *Little Novels of Italy* (1899); *Life and Death of Richard Yea-and-Nay* (1900); *New Canterbury Tales* (1901); *The Queen's Quair* (1904); *The Road in Tuscany* (1904); *Fond Adventures* (1905); and *The Fool Errant* (1905).

Hexagon is any closed figure bounded by six straight lines, and having consequently six angles. The most important case is the regular plane hexagon, in which all the sides are equal, and also all the angles. Being built up of six equilateral triangles, it can be described with great ease either within or without a circle. Equal regular hexagons share with equilateral triangles and squares the property of being pieced together so as to fill plane space completely. The hexagonal form of bees' cells results naturally from the piecing together of equal walled-in regions, so that three walls meet at any point.

Hexameter, the standard verse form in the Latin and Greek languages. It is a measure containing six feet, of which the final foot must be a spondee (two long syllables) or a trochee (a long and a short), the penultimate normally a dactyl (a long and two shorts), and the remaining four feet either dactyls or spondees at discretion. In this metre the great classical epic and philosophical poems were written—the *Iliad*, *Odyssey*,

Aeneid, and Lucretius's *De Natura Rerum*; and in the hands of Virgil it became what Tennyson calls 'the stateliest measure ever moulded by the lips of man.' Efforts have been made, with varying success, to naturalize the hexameter in modern tongues, notably in English in the early Elizabethan times. Their chief product was the preposterous *Aeneid* of Richard Stanyhurst (1582). The next attempt was made in Germany by Klopstock, Goethe, and Schiller; and owing to the presence of quantity in German, it has proved successful. The measure has also been used with considerable success by the Swedish poet Runeberg in *Elgskytterne*, though with a large admixture of anapaests. Three modern English poets have also employed the hexameter—viz. Kingsley, in his *Andromeda*; Clough, in the *Bothie of Tober-na-Vuolich*; and Longfellow, in *Evangeline*. These accept an accented syllable as equivalent to a classical long, and an unaccented as equivalent to a classical short. The objections to this form are briefly these. First, trochees must be accepted as equivalent to spondees. Now the trochee is a light, tripping foot; the spondee a slow, heavy one: the characteristic movement of the measure is therefore different from the classical. Secondly, in English, dactylic measures in time become anapaestic. See VERSE, and Omond's *English Hexameters* (1897).

Hexapla, the name of Origen's famous edition of the Old Testament, which contained in six parallel columns the Hebrew text, the same in Greek letters, and the versions of Aquila, Symmachus, the LXX. (Septuagint), and Theodotion. An abridged edition (Aq., Sym., LXX., Theod.) was known as the Tetrapla. The work is extant only in fragments, given in Montfaucon (Paris, 1713) and Field (Oxford, 1875). See ORIGEN; SEPTUAGINT.

Hexateuch, a term under which are grouped the first six books of the Old Testament. Origen applied the adjective *pentateuchos* to the five so-called books of Moses, and the word passed into popular speech as a substantive, *pentateuch*. The word *hexateuch* (Gr. *hex*, 'six') has been coined by analogy, and is intended to indicate that Joshua is of similar origin and structure with the preceding five.

Until comparatively recently the Christian church all but universally accepted the tradition that Moses wrote the Pentateuch, and Joshua the book bearing his name; nowadays an entirely different view prevails. The change has been brought

about in a truly scientific way—viz. by letting the documents speak for themselves. Thus, certain passages, such as Ex. 17:14, Num. 33:2, Deut. 31:9, Josh. 24:26, which record that Moses (or Joshua) wrote certain specified sections, seem to imply that the writings in their present form were the work of a later time. The account of the death of Moses (Deut. 34), and of Joshua (Josh. 24:29 f.), could hardly have been penned by themselves. Further investigation only serves to clinch these doubts. Thus we have two accounts of the creation (cf. Gen. 1-2:4a with the rest of ch. 2), the one using Elohim (God) and the other Jehovah- or Jahveh- Elohim (Lord God), and each having its own peculiar order of the creative events; in the story of the flood it is stated in one place that seven (?pairs) of clean and two of unclean animals were taken into the ark; in another, one pair of every species (cf. Gen. 7:2-5 with 7:8, 9); compare also the divergent notices of the origin of the names Israel (Gen. 32:28, 35:10), Beersheba (Gen. 21:31, 26:33), Bethel (Gen. 28:19, 35:6 f.); the different names of Moses' father-in-law (Reuel in Ex. 2:18; Jethro, 3:1). Further, the legislative sections also exhibit divergences: for example, in Ex. 23 three annual feasts are enjoined; in Lev. 23, seven; and again, while in Ex. 20:24 altars may be erected to Jehovah in various localities, in Deut. 12:1 ff., 14:23 ff., etc., the worship of Jehovah must be confined to one single centre. (See DEUTERONOMY.) In most of these instances (many more might be given) we have the phenomenon of *parallel* accounts, not always complementary, sometimes exhibiting mere repetition, and not seldom mutual inconsistency.

Now it must not be imagined that facts like these became known only in modern times. The Mosaic authorship of the Pentateuch was more or less directly canvassed by mediæval Jewish scholars like Jishak ben Jasus and Ibn Ezra, by reformers like Carlstadt (Calvin abandoned Joshua), by Catholics like Andreas du Maes (1574), by scholars like Spinoza and Richard Simon (1685). But the real pioneer of modern Pentateuch criticism was Jean Astruc (1733), a French physician, who distinguished two greater sources—A, the Elohist, and B, the Jehovist—and ten smaller writings; Astruc, however, still attributed the compilation of these to Moses. The progress of subsequent investigations and hypothesis forms a study in itself, of which we can give but the barest outline in connection with the more outstanding

names:—(1) The Older Document Hypothesis (Eichhorn, 1780; Ilgen, 1798: Jehovist and two Elohist sources); (2) the Fragment Hypothesis (Geddes, 1792; Vater, 1805; De Wette: two main sources formed from smaller writings); (3) the Supplement Hypothesis (Bleek, Tuck, De Wette ultimately, Franz Delitzsch: the Elohist, the *Grundschrift*—i.e. the fundamental document, supplemented by the Jehovist—Deut. a later addition); (4) the Crystallization Hypothesis (Ewald, Knobel, Schrader: two Elohist, supplemented by Jehovist—the whole redacted by the Deuteronomist who added Deut. 4-28). Hupfeld's analysis into three main sources, added to by a reviser, and Riehm's differentiation of the Jehovist from the Deuteronomist, bring us to (5) the Modern Document Hypothesis, with its four great elements—viz. P, the Priestly Code, the older Elohist, the *Grundschrift*, Wellhausen's Q—i.e. book of the four (quatuor) covenants; E, the (second) Elohist; J, the Jahvist; and D, the Deuteronomist. For these Dillmann uses A, B, C, D respectively.

The existence of these four principal strata in the Hexateuch may be regarded as established. But the theory is now usually combined with a certain view of the Hebrew religion (developed by Reuss, 1834, Vatke, George, Colenso, Graf, Kuenen, Wellhausen), according to which the full codification of the law was subsequent to the teaching of the prophets, and, more generally, the simpler cultus and cruder religious notices preceded the more complicated and refined. The stages of this evolution are supposed to be reflected in the various documents, to which, accordingly, may be assigned dates relatively approximate. Thus J is supposed to be the oldest, though, according to some, E disputes this position; D comes third; and finally P, originally regarded as the oldest, is now placed last, and indeed after the exile. (1.) J, the Jahvist, is a historical work belonging to the golden age of Hebrew literature. He loves, with his unconscious art, to recount the ancient traditions of his race, transfuses them with the light of monotheism, and is an adept at delineating life and character. Gen. 2, 3, 18, 19, 43, 44 may be read as examples of his work. (2.) E is also a historian, and flourished previous to the overthrow of the northern kingdom in 722; he gives more detail than J, and falls short of him in simplicity and grace of style, being also more didactic and theological. Gen. 20-22 (in the main) belongs to him. But J and E

have been welded together so intricately and skilfully that their separation is often merely conjectural, and sometimes impossible; the combined narrative is designated JE—i.e. Jehovist (consonants of Jahveh and vowels of Elohim) and 'the prophetic narrative.' Ex. 20:22 to 23:33 is known as the Book of the Covenant, the 'first legislation.' (3.) D, the Deuteronomist, composed the law-book found in Josiah's reign, 621 B.C., and probably written shortly before. Its style is distinguished by a large number of peculiar words and phrases, and it influenced many later Hebrew writings. It is the 'second legislation,' characterized by spirituality and mildness. (4.) P, the Priestly Code, is a body of historical-legislative work, written according to a clearly marked plan. Its history is often but a bare outline, but it gives full details regarding the origin of such institutions as circumcision, the Sabbath, the tabernacle, etc., and its style is methodical and prosaic. The 'priestly' interests of the narrative indicate its connection with the restored community in the period after the exile. Within P, Lev. 17-26 forms a peculiar stratum, known as LH (Law of Holiness) or HG (Ger. *Heilighkeits-Gesetz*), and probably incorporated from an older code of laws. This 'third legislation,' or rather its historical setting, was used as the framework of the Hexateuch as a whole. The principal stages of the process of combination were somewhat as follows:—(1) J amalgamated with E; (2) D inserted in JE; (3) JED dovetailed into P; (4) various additions and revisions till about the 3rd century B.C. Had the several redactors and compilers written history as men do nowadays, extracting only the facts from the sources, and eliminating and combining till they reach a unified and self-consistent narrative, there would, of course, have been no problem of the Hexateuch. It remains to be added that the rubrics J, E, D, and P indicate schools rather than individuals, and that the first three can be traced in some other books.

See works by the above-named scholars, particularly the later; Robertson Smith's *Old Testament in the Jewish Church* (1892); S. R. Driver's *Literature of Old Testament* (6th ed. 1897); Addis's *Documents of Hexateuch* (1892-8); Dillmann's *Genesis* (trans. 1897); Bacon's *The Genesis of Genesis* (1892); G. A. Smith's *Modern Criticism and the Preaching of the Old Testament* (1902) gives an outline of the development of the criticism; also Cheyne's *Founders of Old Testament Criticism* (1893), Well-

hausen's *De Komposition des Hexateuchs* (3rd ed. 1899), and Holzinger's *Einleitung in den Hexateuch* (1893).

Hexham, mrkt. tn., Northumberland, England, 20 m. W. of Newcastle. The 13th-century church of St. Andrew represents an older church connected with a Benedictine monastery, founded in the 7th century, and refounded as an Augustinian monastery (1113). The old Moot Hall formerly belonged to the priory. From about 680 to 820 Hexham was the see of a bishop. The battlefield of Hexham, in which the Lancastrians were defeated (1464), lies a little S. of the town. Coal and barytes are mined. Pop. (1901) 7,071.

Heyden, or **HEYDE**, JAN VAN DER (1637-1712), Dutch painter, born at Gorkum. He lived chiefly at Amsterdam, but visited foreign countries, including England. He painted principally architectural subjects, one of his best pictures being *View of the Town-hall of Amsterdam* (now in the Louvre at Paris). Many of his pictures are in the National Museum at Amsterdam.

Heyn, **PIET** (1578-1629), Dutch admiral, born at Delfshaven, near Rotterdam. After being a captive to the Spaniards, he defeated them at sea off San Salvador in 1624, and, not far from Bahia (Brazil), in 1626. Two years later he captured the Spanish silver fleet, valued at twelve million dollars, in the Bay of Matanzas (Cuba). He fell fighting against the Dunkirk pirates.

Heyne, **CHRISTIAN GOTTLOB** (1729-1812), German classical scholar, born at Chemnitz, Upper Saxony; was given (1753) an appointment by Count Brühl in his library at Dresden. An edition of *Tibullus* (1755) attracted the attention of Ruhnken of Leyden, and he was eventually (1763) appointed professor at Göttingen. He published annotated editions of Virgil (1767), Pindar (1773), Apollodorus (1782), and the *Iliad* (1802). See *Life* (1813) by Heeren, and Carlyle's essay *On the Life of Heyne*.

Heyne, **MORITZ** (1837), German scholar, born at Weissenfels, in Prussian Saxony, became professor of Old German language and literature at Halle in 1869, at Basel in 1870, and at Göttingen in 1883. He has written on Old German grammar, and has published editions of *Beowulf* (7th ed. 1903), *Heliand* (3rd ed. 1883), *Ulfilas* (10th ed. 1903), a modern *Deutsches Wörterbuch* (3 vols. 1890-5), and has continued the great *Deutsches Wörterbuch* of Grimm.

Heyse, **PAUL** (1830), German novelist, born in Berlin, is a graceful and artistic writer, who

excels in the short story. Good specimens of his work may be read in *Novellen* (1855-62), *Meraner Novellen* (1864), *Buch der Freundschaft* (1883-84). He has also written longer novels—e.g. *Die Kinder der Welt* (1873, 21st ed. 1903; Eng. trans. 1882) and *Im Paradiese* (1875, 13th ed. 1903); as well as poems and dramas—e.g. *Graf Königsmark* (1876) and *Elfriede* (1877). He has translated into German verse the works of several Italian poets. Examples of his work in English translations are *Love Tales* (1862), *Incurable* (1890), and *The Prisoners* (1893). He was patronized by King Maximilian of Bavaria, and lived long at Munich. See Heyse's *Jugenderinnerungen* (1900).

Heysham, port on Morecambe Bay, Lancashire, 5 m. W. of Lancaster, opened in 1904 by the Midland Railway Co. in connection with their new express service to Ireland and the Isle of Man.

Heyst, seaside resort, Belgium, prov. W. Flanders, 16 m. N.E. of Ostend. It carries on fishing. Pop. (1903) 4,158.

Heywood, bor., 3 m. E. of Bury, Lancs, England. The industries are coal-mining, cotton manufacture, sawing and moulding mills. Pop. (1901) 25,461.

Heywood, **JOHN** (?1497-?1580), English dramatist, was probably born in London. Having been introduced at court by Sir Thomas More, he became musician and provider of court entertainments to Henry VIII. The later years of his life were spent at Malines. His chief works (a collection of which was published in 1562) are *A Mery Play between the Pardoner and the Frere* (1533); *A Mery Play between Johan the Husbunde, Tyb the Wife, and Syr Jhan the Priest* (1533); *The Play of the Wether* (1533); *The Play of Love* (1533); *Of Gentylnes and Nobyltye*, a play (1535); *The Four Ps*, a play (?1545); *The Spider and the Fly*, an allegorical poem, dealing with the Catholics and the Protestants (1556).

Heywood, **THOMAS** (?1575-?1650), English dramatist, born in Lincolnshire; began to write for the stage in 1596, and in 1598 was an actor in Henslowe's company. He was the most prolific playwright of his time. He also wrote pageants, poems, lives, and *An Apology for Actors* (1612). *A Woman Killed with Kindness* (1603), his masterpiece, is one of the earliest and most touching examples of English domestic drama. *The English Traveller* and the episode of Jane Shore in *Edward IV.* are other examples of Heywood's pathetic power. In quite a different vein are *The Fair Maid of the West* and *The Captives*, two breezy come-

dies of adventure. See *Thomas Heywood*, ed. by Symonds and Verity (1888).

Hezekiah, king of Judah 726-697 B.C. (the first eleven years probably a regency), was the son and successor of Ahaz, and a contrast in every way to his weak and superstitious father. His intimacy with the prophet Isaiah strengthened his native reforming zeal: he purged the land of idolatry, repaired the temple, and reorganized and endowed the Levitical priesthood. He improved the position of Jerusalem as a stronghold, and wrested his country from the suzerainty of Assyria. Sennacherib thereafter twice invaded Judah; but although the first punitive expedition had a measure of success, the second resulted in the total destruction of his army—an event commemorated in one of Byron's best-known *Hebrew Melodies*. See 2 Kings 18-20 (Isa. 36-39); 2 Chron. 29-32.

Hiawatha, a personage of miraculous descent among the Iroquois. He is said to have been sent on earth to teach men the arts of peace and civilization. It was he who first gave maize to man for food, and taught navigation, also the science of medicine. When the white man came to the country, Hiawatha ascended to the kingdom of Ponemah, the land of the Hereafter. Schoolcraft's version of the tradition in *Algonic Researches* (1839) is the basis of Longfellow's poem.

Hibbert, Sir John Tomlinson (1824), English politician, represented Oldham in Parliament (1862-74); became parliamentary secretary to the Local Government Board under Mr. Gladstone (1872). Unseated at Oldham (1874), he was re-elected (1877, 1880, and 1892). In 1880 he returned to his old post under Gladstone, being subsequently (1883) under-secretary to the Home Office. From January to July 1886 he had a seat on the Treasury bench as secretary to the Admiralty, and was secretary to the Treasury (1892-5).

Hibbert Lectures, a series of lectures founded by the trustees of Robert Hibbert (1770-1849), son of a Jamaica merchant. In 1847 he conveyed to trustees fifty thousand dollars for the purpose of founding scholarships and fellowships, lectures being included by the trustees since 1878, when the first series was delivered by Professor Max Müller. Carrying out the design of the founder 'to promote comprehensive learning and thorough research in relation to religion as it appears to the eye of the scholar and philosopher, and wholly apart from the interest of any particular church or system,' the trustees arranged

for lectures by Renouf, Renan, Rhys Davids, Kuenen, Reville, Pfeiderer, Sayce, D'Alviella, Hatch, Montefiore, and others.

Hibernation is a very common phenomenon in animals inhabiting high latitudes, and is a means whereby they avoid the rigour of the winter cold. In a hibernating animal the temperature of the blood may be greatly reduced, the heart beats feebly, the breathing is slow, and the function of digestion may be suspended. Generally speaking, the lowering of the external temperature in autumn is the immediate inducing cause of hibernation, but such facts as that reptiles kept in an artificially warmed chamber throughout the year often die, apparently for want of the seasonal rest, show that hibernation, like ordinary sleep, may be simply an expression of a physiological rhythm. Again, it is stated that the American woodchuck (*Arctomys monax*) retires to rest in autumn while food is still abundant and the temperature not low, and wakes in early spring, although the snow may be still on the ground. In spite of such puzzling cases, it may be said generally that hibernation begins with the lowering of the temperature and scarcity of food in autumn, and ceases when spring brings abundant food and warmth. Where the winter sleep is profound, no food is eaten during its continuance, the animals living upon the stores of fat accumulated in summer, and waking thin and emaciated in spring. In other cases the winter nest contains stores of food laid up during the season of plenty, and to these the animal betakes itself whenever any rise of temperature induces activity. The common squirrel, for example, although a hibernating animal, may be seen in full activity at Christmas time during a spell of mild weather. The prolonged and deep sleep of its ally, the dormouse, has, on the other hand, become a byword, although the dormouse also stores food for winter. An interesting case is that of the bears, for in several species it seems to be the female only which hibernates, the male remaining active throughout the winter, or at least as long as food is obtainable. In the sleeping-place of the female the cubs are born, and the mother emerges with her young in spring in a voracious condition, and much more actively carnivorous than at other times. Among amphibians and reptiles hibernation is universal in cold climates; in birds it does not occur; and in mammals it occurs sporadically, being perhaps most frequent in rodents.

Hibernia, called also **IERNE**, **IVERNA**, or **JUVERNA**, the name by

which Ireland was known to the ancient Romans.

Hibernia, a first-class British battleship belonging to the King Edward VII. class, launched at Devonport in 1905. The load displacement is 16,350 tons, and speed 18½ knots.

Hibiscus, a genus of plants, mostly tropical or subtropical, belonging to the order Malvaceae. Most of the species bear attractive flowers, and in Britain many are cultivated in greenhouses and the open air. Only in very warm and sheltered localities, however, can even the hardiest of the perennial rose mallows be grown in the open in England. The greenhouse Hibiscus like plenty of root space and a peaty soil. Abundance of water should be given during summer; but in winter the plants may be kept fairly dry. *H. abelmoschus* is used in the north-west of India for clarifying sugar.

Hiccup, or **HICCOUGH**, or **SINGULTUS**, is a sudden spasmodic contraction of the diaphragm, accompanied by closure of the glottis. It may be caused by abnormal stimulation of any part of the phrenic nerve. Hiccupping is therefore a reflex act, and most frequently follows irritation of the mucous membrane of the stomach. A draught of cold water or the retention of the breath for a few seconds suffices for a cure. When, however, the condition is persistent and intractable, it is a more serious symptom, and may point to peritonitis or to strangulation of the bowel. It is also common in the last stages of exhausting illness. In such cases it generally heralds the near approach of death, and nothing can be done to check it.

Hichens, **ROBERT SMYTHE** (1864), English novelist, was born at Speldhurst, Kent; became a student at the Royal College of Music. He published *The Green Carnation* anonymously in 1894, at the height of the famous æsthetic movement, and it was an immediate success. Hundreds of readers who cared little about the æsthetic movement were delighted by the brilliant wit and charm of writing. In its finish and literary skill it was certainly a remarkable entry of a new author. *The Green Carnation* was followed by *An Imaginative Man* (1895), *The Folly of Eustace* (1896), *Flames* (1897), *The Londoners: a Farce* (1898), *Byeways* (1897), *The Slave* (1900), *Tongues of Conscience* (1900), *The Prophet of Berkeley Square* (1901), *Felix* (1902), *The Woman with the Fan*, early in 1904, *The Garden of Allah*, late in 1904, a love-story of a moving and poignant nature, studied with altogether exceptional skill and insight, and *The Black Spaniel*

(1905). Mr. Hichens collaborated with Mr. Wilson Barrett in the successful play *The Daughters of Babylon*, and was co-dramatist of *The Medicine Man* and *Becky Sharp*.

Hickes, GEORGE, (1642-1715), English prelate, born near Thirsk, Yorkshire; refused to take the oath of allegiance to William of Orange. Deprived of the deanery of Worcester, he became suffragan bishop of Thetford, appointed by his non-juring brothers to the see. As a non-juror Hickes held out to the last, and occupied his enforced leisure in writing theological treatises, among them his able *Institutiones Grammaticæ Anglo-Saxonice* (1689), one of the best antiquarian works in our literature, although written in Latin.



Hickory.

1, Male flower; 2, fruit; 3, peeled nut.

Hickory (*Carya*), a genus of ornamental, hardy, deciduous American trees, belonging to the order Juglandaceæ. They bear pinnate leaves with serrate margins. The male flowers are borne in conspicuous catkins, and the female flowers are followed by large, dry, green fruits, containing edible nuts. The trees are best raised from nuts in the sites they are to occupy, as they are somewhat difficult to transplant, their roots being nearly fibreless. If they are to be moved, it is essential that they should be frequently transplanted when very young. The trees are tall-grow-

ing and very handsome, and the wood is valued for tool handles, etc. Among the species worthy of cultivation in Britain are *C. tomentosa*, the white-heart hickory, which has tomentose leaves and stems; *C. amara* or *C. minima*, the swamp hickory; and *C. myristicifolia*, the nutmeg hickory. The so-called hickory nuts are produced by *C. alba*; the pecan-nuts by *C. olivaeformis*.

Hicks, EDWARD SEYMOUR (1871), English actor and author, born at St. Heliers, Jersey; joined the Gaiety company as principal light comedian (1893). He is the author of *This World of Ours* (1889); *Uncle Silas*; *One of the Best*, a play founded on the Dreyfus affair; *Sporting Life*; and *The New Sub* and *Good-bye*, one-act plays produced at the Court Theatre; also *Under the Clock*, a burlesque; and the *Yashmak*, a musical play. He became lessee in 1902 of the Vaudeville Theatre, at which he has appeared in Barrie's *Quality Street*, and with Miss Ellaline Terriss and the Vaudeville Theatre Company.

Hicks, ELIAS (1748-1830), American Quaker, born at Hempstead, Long Island. At twenty-seven he was a regular preacher, though his heterodox views on the nature of Christ nearly caused a schism among the Friends. He was indefatigable, even up to an advanced age, in the propagation of his doctrines and in agitation against slavery. See his own *Journal* (1832).

Hicks, WILLIAM (1830-83), Anglo-Egyptian general, known as Hicks Pasha; was staff officer in the Rohilkand expedition; served in the Abyssinian war (1867-8). In 1883 he was transferred to the Egyptian army, and was placed in command against the Mahdi (1883). After defeating the enemy at Jebel Ain (April 29) he ascended the White Nile to Duem, and thence crossed the desert to El Obeid. Ambushed (November 1) by the Mahdi in person, his Egyptians resisted bravely until the fourth day. Only the rearguard escaped this massacre, known as the battle of Kashgil. See Colborne's *With Hicks Pasha in the Soudan* (1884).

Hicks-Beach, SIR MICHAEL EDWARD. See ST. ALDWIN, VISCOUNT.

Hidalgo, a member of the inferior nobility in Spain. Their privileges were abrogated when constitutional government was set up, and they now rank as ordinary citizens.

Hidalgo, state, Mexico, having on the S. the states of Mexico and Tlaxcala. Crossed in the N. and N.E. by the Sierra Madre, this part of the state is wild and mountainous. The S. and W., however, contain many fertile

valleys. Mining is the chief industry—silver, gold, quicksilver, copper, lead, iron, and zinc being worked. The capital is Pachuca. Area of state, 8,917 sq. m. Pop. (1900) 603,074.

Hidalgo de Parral, tn., Mexico, state of Chihuahua, 125 m. S. of tn. of Chihuahua, with silver mines. Pop. (1901) 14,748.

Hide, of land (*carucata* = hide), a measure of land equal to as much as a plough can plough in a year, and generally consisting of 120 ac., though it varied locally from 40 to 180 ac. It might also include the house and garden of the ploughman.

Hides. See LEATHER.

Hiel, EMMANUEL (1834-99), Flemish poet, born near Dendermonde; civil servant and professor at the conservatory of music in Brussels; one of the chief lyric forces of modern Flemish; has written *Gedichten* (1863, 1868), *Nieuwe Liedekens* (1861), *Liederen voor Groote en Kleine Kinderen* (1875, 1879), *Bloemeken* (1877), *Bloemardinne* (1877), etc.; besides hymns—*De Wind* (1869) and *Vrijheidshymne*; patriotic poems—*Belgenland*, *Eer Belgenland*; songs—*Lucifer*, *De Schelde*, etc. His poems were collected as *Volledige Dichtwerken* (1885).

Hiempsal, two Numidian princes. (1.) Son of Micipsa, king of Numidia, was murdered by his half-brother, Jugurtha, soon after his father's death in 118 B.C. (2.) Grandson or great-grandson of Masinissa, received part of Numidia after the downfall of Jugurtha, and though expelled during the civil war in Rome by the Marian party, he was restored in 81 B.C. by Pompey.

Hieracium. See HAWKWEED.

Hierapolis. (1.) The 'Holy City' (Col. 4:13), stands above the Lycus valley, Phrygia, Asia Minor. It was a seat of worship of the goddess Leto, and a centre of Phrygian nationality. There are considerable ruins, and the place is noted for the remarkable calcareous deposits from large springs. Strabo mentions the Plutonium, a hole reaching deep into the earth, from which issued a mephitic vapour. The apostle Philip is connected by tradition with the early church at Hierapolis. See Ramsay's *Cities and Bishoprics of Phrygia*, vol. i. (1895). (2.) Or HIEROPOLIS, anc. city, Syria, Cyrrhæstia, 47 m. N.E. of Aleppo, and 14 m. W. of Euphrates; was called by the Greeks Bambyce, and was one of the chief seats of the worship of Astarte, whose great temple was robbed by L. Crassus in 53 B.C. Its modern name is Mambej.

Hierarchy, the entire body of the clergy of a church; also government by priests.

Hières. See HYÈRES.

Hieroglyphics. This name was given originally by Greek and Latin authors to a kind of writing used in ancient Egypt, which was employed chiefly in official inscriptions, and became peculiarly a part of the knowledge of the priestly classes; hence the name 'sacred writing.' To a large extent the Egyptian hieroglyphics are obviously pictures of natural objects, and although it is now known that the symbols express not only words but also syllables and letters, the term hieroglyphics has acquired the general sense of picture-writing. Understood in this wider acceptance, hieroglyphic writing is the oldest and most primitive of all kinds of writing. Even some of the letters of the Roman alphabet which we ourselves still use may be traced back to the rude pictures from which they came. (See ALPHABET.)

Picture-writing even in its most elementary stage is more than a picture. It expresses not so much words as ideas. It is therefore termed ideographic, and the symbols used are called ideograms. Those who read the meaning of the symbols are free to choose their own words when they do so. The symbols may have their meaning faithfully expressed in speech in a variety of ways, and even in a variety of languages. The picture-writing of primitive peoples is of this character. It is a great step in advance when writing becomes a representation of speech. The final result is the complete transformation of the original picture-writing. The symbols represent words, and so cannot always be self-interpreting pictures. The symbols must be stereotyped and their number increased. As the desire for exactness grows an attempt is made to express mere differences of grammatical form. At this point pictorial writing, as such, finally breaks down. Symbols are invented for syllables and even for letters. The picture-writing of civilized peoples is always of this second type or class.

The ancient Egyptian system of writing can be traced for four thousand years or more, and throughout that time it preserved in a striking manner, externally, its pictorial character. Probably this was due in large measure to the fact that conventional modifications of the hieroglyphic writing proper were used for business and literary purposes. The oldest Egyptian cursive writing is known as the *hieratic*; a later modification of that is called *demotic*.

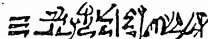
The modern decipherment of the Egyptian hieroglyphics was suggested and rendered possible

by the discovery in 1799 of the Rosetta stone by one of the officers of Napoleon the Great. This stone is now one of the treasures of the British Museum, and contains a trilingual inscription written in hieroglyphics, in the demotic character, and in Greek letters. The first important attempt at decipherment was made by the English physician and scientist Dr. Thomas Young (1773-1829). But the credit of laying the foundations of our present knowledge of the Egyptian language and literature belongs chiefly to the French-



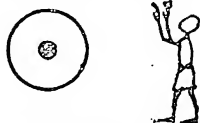
Demotic Egyptian, 19th Dynasty.

man Francois Champollion. The Egyptian hieroglyphic system is by no means of a simple or primitive character. It is indeed partly ideographic. The representation of the sun stands not only for the sun itself, but also for the word 'day.' The figure of a man in the attitude of prayer expresses the conception of worship. Alongside of such primary symbols are combinations of sim-



Demotic Cursive Egyptian, 11th Dynasty.

ple picture-signs used to express conceptions too complicated for representation by a simple character. For the most part, however, the hieroglyphic signs are not ideographic or expressive of words; they are phonetic—i.e. they express sounds, both syllables and simple sounds. Certain picture signs which originally denoted words came to denote merely the first letters of these



Ideographs for 'day' and 'worship.'

words. In fact, the Egyptians continued to use side by side, intermixed with one another, three kinds of characters—ideographic, syllabic, and alphabetic. The old word signs or ideograms were retained chiefly as 'determinatives.' A word which is spelled in alphabetic or syllabic characters may be followed by an ideogram representative of the same word. There are also generic determinatives, used to denote the class of the words that they follow, as, for example, a royal or a divine name, or an action of a particular kind. Ambiguous words also are defined

by means of determinatives. In fact, ideograms are seldom used independently of the simpler and more definite phonetic spelling which was in general use.

The oldest historical documents in the world are probably preserved in the cuneiform or wedge-shaped character which was in use amongst the Babylonians and Assyrians. The cuneiform characters are partly ideographic and partly syllabic; some of them represent words and some represent syllables. The employment of ideograms as determinatives is a feature of cuneiform writing also. The peculiar wedge-shaped appearance of every stroke in the ordinary characters is due to their having been printed on clay tablets with an instrument of a certain shape. But in the oldest documents the lines are ordinary straight lines. There are more than four hundred signs in general use. Of these it is maintained that the vast majority are composite (Friedrich Delitzsch). Only some forty-five can be reckoned as primitive. These, it is thought, may be identified to a large extent with primitive pictures of natural objects, such as the 'sun and moon, a star, a mountain, a man, parts of the human body, animals, plants, and domestic utensils.' They include also, it appears, a certain number of conventional signs expressive of certain actions and abstract ideas or simple mathematical conceptions. A very few additional signs appear to have been got by the differentiation of one character into two. It is generally supposed that this cuneiform writing was the invention of a non-Semitic people, and that it was adopted from them by the Babylonians and Assyrians. These in turn passed it on to other peoples, such as the Armenians and the Persians. Amongst the Persians the signs acquired, for the most part, an alphabetic value.

The oldest Chinese inscriptions, and even the earliest use of writing in China, so far as can be ascertained, are of much later date than the periods to which the Egyptian hieroglyphics and the Babylonian cuneiform writing belong. But Chinese writing has an independent history curiously parallel in some respects to these other systems. The forms of certain of the signs in their earliest known shape make it clear that they were originally pictorial. The Chinese themselves distinguish a large number of such signs. Probably, at first, there were only a limited number, which has been largely increased by combinations of the primitive symbols; for many word signs have been borrowed from other words

related to them in meaning. Chinese supplies also an example of the transition from a pure ideographic system to a mixed system in which phonetic characters are employed. These phonetic characters, denoting sounds, are by far the most numerous in Chinese writing. Unfortunately the language is now rich in words that are pronounced similarly, although quite different in meaning. The phonetic spelling of a word, therefore, does not sufficiently determine its meaning. This difficulty has particularly favoured the use of determinatives. They are 214 in number, and denote the class to which a word belongs. The determinative is combined in writing with the phonetic character so as to form a compound sign. Thus every word has practically a special sign of its own, and the total number of separate characters in the language is enormous. The Chinese system of writing is perhaps the most cumbrous that has ever existed.



Boss with Assyrian and Hittite Inscription (after Berger).

Within quite recent years attention has been drawn to a number of monuments in Syria and Asia Minor on which are sculptures and hieroglyphic inscriptions, which it is believed are the work of the ancient Hittite people. It is believed that these monuments belong to the period 1200-800 B.C., but as yet their decipherment is merely at the initial stage. The only bilingual inscription, a seal with Hittite and Assyrian characters upon it, is too short and obscure to give much assistance. Various scholars have attempted to determine the values of the characters. The most promising work has been done by Jensen. In England Professor Sayce has devoted special attention to the subject. See Berger's *Histoire de l'Écriture dans l'Antiquité* (2nd ed. 1892); Budge's *First Steps in Egyptian* (1895); Rogers's *History of Babylonia and Assyria* (vol. i. 2nd ed. 1901), for history of decipherment of cuneiform; Delitzsch's *Assyrian Grammar* (trans. 1889) and *Entstehung des ältesten Schriftsystems* (1897); Gabelentz's *Chinesische Grammatik* (1881); Jensen's *Hittiter und Armentier* (1898); also PICTURE-WRITING, and EASTER ISLAND.

Hieron, or **HIERO**. (1.) Tyrant of Syracuse from 478 to 467 B.C., succeeding Gelo his brother; his chief exploit was a victory over the Etruscans in 474 B.C., which broke their naval power. He won several victories in the Greek games, which were celebrated by Pindar and Bacchylides, who, with Simonides, Æschylus, and other poets, were greatly patronized by him. (2.) King of Syracuse from 270 to 215 B.C. In the first Punic war he was allied to the Carthaginians; but in the second year of the war (263 B.C.) he joined the Romans, and was their faithful friend for the rest of his life.

Hieronymites (from Hieronymus, better known as St. Jerome), an order of hermits, constituting a branch of the Franciscans, was founded by Thomas of Siena in the 14th century. The order is also known as 'Brethren of the Common Lot,' 'Brethren of Goodwill,' and 'Gregorians.'

Hieropolis. See **HIERAPOLIS** (2). **Hierro**, or **FERRO**, isl. of Canary Is. Area, 160 sq. m. Cap. Valverde. Ferro was in early times accounted the most westerly of known lands, and its meridian is said to have been used as the prime meridian by Ptolemy (2nd century A.D.). Louis XIII. enacted that the meridian of Ferro—i.e. the 20th meridian W. of Paris—should be the first meridian. This meridian is 17° 39' 45" W. of Greenwich, and really runs 2 m. E. of the island. Pop. about 6,000.

Higden, **RANULPH** (d. 1364), English chronicler, born in the west of England; became a Benedictine monk at Chester, and was the author of the *Polychronicon*, which gives the history of the world from the creation to the time of Christ, and the history of England up to 1342. Ed., with Eng. trans. by Babington and Lumby (1865-86), in Rolls Series.

Higgins, **MATTHEW JAMES** (1810-68), English essayist, known as Jacob Omnium, born in Co. Meath, Ireland; best remembered for letters to the *Times* (1847-63), in which he exposed many abuses. His first published paper was 'Jacob Omnium, the Merchant Prince,' in *New Monthly Magazine* (1845). See Memoir by Sir Wm. Stirling-Maxwell, prefixed to his *Essays on Social Subjects* (1875).

Higginson, **THOMAS WENTWORTH** (1823), American author and lecturer, born in Cambridge, Massachusetts; became pastor of a church in Newburyport (1847-50), and thereafter (1852-8) of the Free Church of Worcester. An eager participant in the anti-slavery agitation, he was colonel of a 'freed' negro regiment during the civil war. His works

include *Out-door Papers* (1863); *Army Life in a Black Regiment* (1869); *Oldport Days* (1873); *Lives of Margaret Fuller Ossoli* (1884), *Francis Higginson* (1891), *Longfellow* (1902); *John G. Whittier* (1903); *Afternoon Landscape—Poems* (1889); *Larger History of the United States* (1885); *Cheerful Yesterdays* (1898); *Tales of the Enchanted Islands of the Atlantic* (1898); and *Part of a Man's Life* (1905). Higginson's *Collected Works* were published in 7 vols. (1900). See Bentzon's *A Typical American* (1903).

High Commission Court, a court composed of clerical and lay commissioners nominated by the crown, and established by Queen Elizabeth in 1559 to make inquiry into cases connected with church discipline, as the Star Chamber did into civil offences. It was, in fact, designed 'to bring men's souls and bodies into submission,' after the manner of the Inquisition. In the reign of James I. Coke ruled that the court could only imprison or fine for heresy or schism. The court became a useful tool in the hands of Laud. It was abolished, with the Star Chamber, in 1641, by the Long Parliament; revived by James II. in 1686, to deprive or suspend clergymen who made themselves obnoxious to the law; and finally got rid of in 1689. A similar court existed in Scotland from 1603 to 1638.

High Court of Justice. See **SUPREME COURT**.

Higher Education of Women. See **WOMEN**.

Highgate, residential suburb of London, Middlesex, 4½ m. N.W. of St. Paul's. In 1626 Bacon died at Arundel House, and Coleridge, the poet, at the Grove (1834). Whittington's Stone is believed to mark the spot where Whittington heard Bow Bells and turned again. In Highgate Cemetery are buried Lord Chancellor Lyndhurst, Faraday, and George Eliot. Coleridge's remains lie in the old burial-ground.

Highland is a term used in geography in opposition to lowland, but no exact limit of height can be given. If height alone be considered, it is desirable to distinguish three zones—(a) the lowland under 660 ft. (200 metres), which constitutes 29.8 per cent. of the land surface; (b) the uplands, between 660 and 3,300 ft. (200-1,000 metres), forming 46.1 per cent.; and (c) the highlands, over 3,300 ft. (1,000 metres), making 24.1 per cent. The term highland is also used to distinguish rugged lands from relatively flat lands. In this sense the word is best applied to distinguish denudation mountains, such as the Scottish or Scandinavian Highlands, from tectonic mountains, such as the

Alps, or table-lands like Arabia. Such highlands are due to the cutting out of valleys in an elevated area which has formerly been denuded almost to a plain. Seen from one of the summits the highest points appear to reach somewhat similar elevations, so that if the valleys were filled up the old plain would be

from Brittany to Poland across Central Europe; they are found in the Urals, in N.E. and E. Asia, in E. Australia, in the extreme S. of S. Africa, in the Appalachian and Laurentian highlands of N. America, and in Greenland.

Highland Dress. The garb of the Highland contingent of the Scottish Royalist army in 1639 is

ent day; for instead of trousers, a distinctively Celtic garment, it was the kilt that became specially associated with the Scottish Highlanders. In his *Journey through Scotland* (1723) Macky thus describes the Highlanders whom he saw at the Michaelmas tryst at Crieff: 'The Highland gentlemen were mighty civil, dressed in their slashed short waistcoats, a trousing (which is breeches and stockings of one piece of striped stuff), with a plaid for a cloak, and a blue bonnet. They have a poniard, knife, and foik in one sheath [i.e. the dirk], hanging at one side of their belt, their pistol at the other, and their snuff mill before, with a great sword by their side. Their attendance was very numerous, all in belted plaids, girt like women's petticoats down to the knee, their thighs and half of the leg all bare. They had also each their broadsword and poniard.'

The use of the kilt seems, however, to have become more and more general in recent centuries. When Taylor, the 'water poet,' visited Scotland in 1618, he found the nobility and gentry wearing the kilt when hunting. The kilt was formerly much worn in Ireland, the home of the Gaels. From the accounts of Derrick and Spenser it is evident that the large plaid and the 'sporrán,' or purse, constituted the entire garb of many contemporary Irishmen; and even in 1688 some of the islanders of Mull wore little more. (See Sacheverell's *Isle of Man*, 1702, p. 129.) The custom of belting the large plaid (*feile*) at the waist, so as to form a tunic, led to the evolution of the kilt ('little plaid' or *feile-bheag*) as a separate garment; and the plaid itself gradually dwindled to its present dimensions. See J. S. Stuart's *Vestiarium Scoticum* (1842), and J. S. and C. E. Stuart's *Costume of the Clans* (new ed. 1892).

Highland Regiments. There are six Highland regiments in the British army. All wear the distinctive kilt, with the exception of the Highland Light Infantry. During the last few years the Highlanders have been chiefly noticeable at the storming of Dargai by the Gordons (Oct. 20, 1897), and at the battle of Magersfontein, where the brigade was decimated. Under the new system of brigade depôts, the headquarters of the Highland Brigade are at Perth. The Highland Light Infantry, however, has been attached to the Lowland Brigade for administrative purposes, a decision which has excited much criticism in Parliament and the press.

Highlands. See SCOTLAND.



Highland Dress.

1. Lim croich, earliest form. 2. Breacan an feile, the belted plaid. 3. Arisaid, women's dress. 4. Trews. 5. Modern full dress.

reconstructed. Some summits here and there rise a little above the others, and are supposed to be the relics of the heights which formerly rose above the almost base-levelled plain. Using highlands in this sense, we find that they lie between about 1,500 and 6,000 ft., and only exceptionally to 9,000 or 10,000 ft. They are found in N.W. Europe, in Britain and Scandinavia; they stretch

thus described by Defoe (*Memoirs of a Cavalier*, ed. 1809, p. 201): 'They wore 'a cap on their heads, called by them a bonnet, long hanging sleeves behind, and their doublet, breeches, and stockings of a stuff they called plaid, striped across red and yellow, with short cloaks of the same.' This ancient Celtic dress has persisted, although in a modified form, down to the pres-

Highness, an honorary title used in speaking of or addressing princes, grand-dukes, and minor crowned rulers. The title was used by the kings of England till Henry VIII. changed it for 'Majesty.' The Sultan of Turkey is addressed as 'Your Highness;' the children of emperors are 'Your Imperial Highness;' the children of kings, 'Your Royal Highness.'

High Priest, the head of the Israelite priesthood. According to the writing known as P, the first high priest was Aaron, who was succeeded by his son Eleazar, from whose line the later holders of the dignity required to be taken. The high priest was distinguished from the ordinary priests by his elaborate and costly robes, together with the ephod and the breastplate, the receptacle of the Urim and Thummim. His special prerogative was to enter the Holy of Holies on the day of Atonement, in order to make propitiation for the people, the sanctuary, the priests, and himself. He was under more stringent rules regarding purity than his inferior brethren: for example, he was permitted only to marry a virgin, he was prohibited from touching a corpse, even that of his father or mother, and from manifesting the customary signs of mourning. In the New Testament 'high priest' and 'chief priest' represent the same Greek word *archiereus*; the latter (always in the plural), however, presumably embraces both the high priest then in office and such of his predecessors as were still alive. See **PRIEST**.

High Seas, a term denoting that portion of the sea which is free to everybody, and not the property of any particular nation. National rights are restricted, by international law, to the area within three miles of the shores. By recent enactments trawling is confined to the high seas.

High Steward of England, formerly the greatest officer of state in England. The office was established prior to the reign of Edward the Confessor, and was anciently annexed to the lordship of Hinckley, belonging to the Montfort family, earls of Leicester, till it was forfeited for treason by Simon de Montfort to Henry III., who abolished the office in 1265. It is, however, revived for special occasions, such as a coronation or the trial of a peer. In the former case this officer has to arrange questions of precedence; in the latter case he presides over the House of Lords, the first lord steward for the trial of a peer being the Earl of Devon, on the arraignment of the Earl of Huntingdon in 1400. At the corona-

tion of William IV. and Queen Victoria the tenth Duke of Hamilton acted as lord high steward. At the coronation of Edward VII. the Duke of Marlborough officiated in this capacity.

High Treason. See **TREASON**.

Highwayman. In the 17th and 18th centuries highwaymen were to be found on every high-road in England. The nature of their calling made it essential that they should be good riders and very well mounted; hence, in order to escape detection, they were obliged to maintain the appearance of gentlemen. Although a few of them were men of good birth and education, the majority of the 'gentlemen of the road,' as they called themselves, were far below the level at which fiction has represented them. Among the most famous were Claude Duval (1643-70), Jonathan Wild (1682-1725), Jack Sheppard (1702-24), Dick Turpin (1706-39), Jerry Abershaw (1773-95), and John Nevison (hanged at York, 1684).

Highways. A highway is a way that is open and common to all the king's subjects. It may therefore include a footway, a bridle-path, a driftway, a high-road, a bridge, a towing-path, or a cul de sac. A highway may be created by Act of Parliament, or by dedication, express or implied. A person wishing to dedicate a road to the public, and to convert it into a highway, so as to throw upon others the duty of repairing it, must proceed under the Highway Act of 1835, or the Public Health Act, 1875, dealing with the dedication of highways; and often the liability to repair remains on the owner of land by reason of his holding; but for all other purposes, other than that of creating a liability to repair, a dedication may be made by parol, provided it be made openly, and with intention to dedicate. The dedication may be qualified as to the manner of using the road, as, for instance, it being subject to having a gate across it; but it must not be limited as to the number or class of people who may use it, nor to the duration of it. A highway cannot cease to be a highway by non-user. Long user by the public without protest or interference will create a presumption of dedication, and even a short period (e.g. eighteen months) will be enough if the intention to dedicate is plain. An owner, therefore, who allows the public to cross his land, but who does not wish them to acquire a right to do so, should occasionally stop the user, to show that the user is merely by licence. A person may not use a highway for other purposes than those

of a highway; consequently the owner of the soil may maintain an action against one who uses it for loitering. Any private person may abate a nuisance existing on a highway, if it causes him any special injury, but only so far as it may be necessary to enable him to exercise his right of passing over it. By the Local Government Act, 1894, the duties and liabilities of the various highway authorities were transferred to the district council of every rural district, and all highway boards were abolished. But main roads—i.e. roads disturnpiked since 1870—must be maintained by the county council, and some footpaths are repaired by the parish council. It is the duty of the district council to protect rights of way, and to see that persons responsible for the repair of highways keep them in repair. When a person lawfully using a highway suffers damage by reason of the non-repair of a highway, he has no right of action at law for damages against any one. But in the case of active misfeasance a public body whose duty it is to repair the highway may be sued by any one who has suffered damage by reason of any act of commission—e.g. sprinkling salt on snow. The obstruction of a highway, unless it be absolutely necessary, is an indictable offence, although the accused may have acted quite innocently, as, for instance, by exhibiting in his windows something which has caused a crowd to collect and so to obstruct the highway. By the Highways and Locomotives Amendment Act, 1878, if any authority liable to keep any highway in repair is of opinion that it is unnecessary and ought not to be maintained at the public expense, such authority may apply to the justices to view the same; and if the court is of opinion that the application ought to be proceeded with, it may, after hearing objections, dismiss the application, or declare the highway to be unnecessary, and that it ought not to be repaired at the public expense. Under the Highway Act, 1835, s. 84-92, a highway may be stopped or diverted if it is unnecessary, or if a better way is to be substituted, but only with the consent of the district and parish councils, and after wearisome and endless formalities. Under the Highway Act, 1835, a person may not sink an unprotected pit or erect an exposed steam-engine within twenty-five yards, or erect a windmill within fifty yards, or burn clay or stone within fifteen yards (unless the fire is screened) of any part of a road or carriage-way. Neither may he ride on the footpath by the road-

side, nor drive nor tether an animal thereon, nor play football nor bait bulls, nor erect a tent on a highway; nor fire squibs within fifty feet of the centre of a highway, nor allow offensive matter to run into the highway, nor allow cattle to wander on a highway. A person driving on the wrong side of the road, or not having his carriage under proper control, or furiously driving, is liable to a fine, and in certain cases imprisonment. In Scotland there is no common law obligation on the parish to maintain its highways. The management of highways was transferred to county councils by the Local Government (Scotland) Act, 1889, from the county road trustees, whose powers are contained in the Roads and Bridges (Scotland) Act, 1878. The management of streets in burghs is vested in the commissioners appointed under the Burgh Police (Scotland) Act, 1892. In consequence of the extra wear and tear of roads by motor cars, an agitation has recently arisen for the heavier taxing of these vehicles. It has been suggested that the proceeds of such a tax should be applied to the maintenance of the highways, and in this way motor traffic would bear a proportionate share of the additional cost of road maintenance it has given rise to. See Pratt's *Law of Highways* (15th ed. 1905), and Green's *Encyclopedia of the Law of Scotland*.

High Wycombe. See WYCOMBE.

H.I.H., His Imperial Highness. Híjar, tn., prov. Teruel, Spain, 66 m. N.E. of Teruel. It contains the ancient palace of the dukes of Híjar. Pop. (1900) 3,348.

Hikone, tn., Honshiu, Japan, on E. side of Lake Biwa; has ancient feudal castle. Pop. about 19,000.

Hikwa. See RIKWA.

Hilarion, St. (?292-372), religious ascetic, was born at Tabatha, near Gaza, Palestine. He studied at Alexandria, where he became a convert to Christianity. He then retired to the desert, and gained a reputation for asceticism. Many monasteries were founded either by Hilarion or in his name. He died at Cyprus. The whole story is now doubted.

Hilary, St. (?320-368), bishop of Poitiers, born at Limonum (Poitiers), and converted to Christianity about 350. In 353 he was chosen by popular acclamation bishop of Poitiers, and devoted himself to a struggle with Arianism. Banished to Phrygia in 356 because he would not acquiesce in the banishment of St. Athanasius, he travelled among the churches of Asia Minor, and

returned to Poitiers in 362. His writings, the chief of which is a treatise on the Trinity, are important for elucidating the history and doctrines of the Arians. So powerful were his refutations of Arianism that he received the name 'Malleus Arianorum,' the Hammer of the Arians. See J. H. Reinkens's *Hilarius von Poitiers* (1864), and J. G. Cazenove's *Saint Hilary of Poitiers* (1883).

Hilary, St., OF ARLES (401-449), born in S. Gaul; entered the monastery of Lerins, but was recalled to assist the bishop of Arles, and became his successor (427). He had an acute controversy with Leo the Great over a deposed Gallic bishop who had been reinstated by Rome.

Hilda, or HILD, St. (614-680), entered a nunnery in 647 or 648, and two years later was made abbess of Hartlepool. In 658 she founded the monastery at Whitby. See A. D. H. Leadman's *Vita Sancta Hilda* (1902).

Hildburghausen, old town, Germany, in the duchy of Saxe-Meiningen, on the Werra, 19 m. by rail S.E. of Meiningen; manufactures toys, cutlery, and fancy goods. From 1633 to 1826 it was the chief town of the duchy of Saxe-Hildburghausen. Pop. (1900) 7,502.

Hildebrand. See GREGORY VII.

Hildebrand, EMIL (1848), Swedish historian, born at Stockholm, where he was appointed (1880) lecturer on history at the high school. In 1901 he was appointed director of the Swedish archives. He has published *Svenska Riksdagsakter, 1521-1718* (1887, etc.), with O. Alin; *Waltenstein und seine Verbindungen mit den Schweden* (1885); *Svenska Skriftprof från Erik den Heliges Tid till Gustaf III's* (1894-1900); and *Svenska Statsförfatningens Historiska Utveckling* (1896); and has edited the organ of the Swedish Historical Society since its foundation in 1881, and the illustrated *Sveriges Historia intill 20de Seklet* (1902, etc.).

Hildegard, St. (1098-1179), religious mystic, born at Böckelheim in Germany; was brought up in the nunnery of Disibodenberg in Lorraine, of which she became abbess. In 1147 she founded a monastery at Bingen, which she ruled until her death. See Schmelzeis's *Leben* (1879).

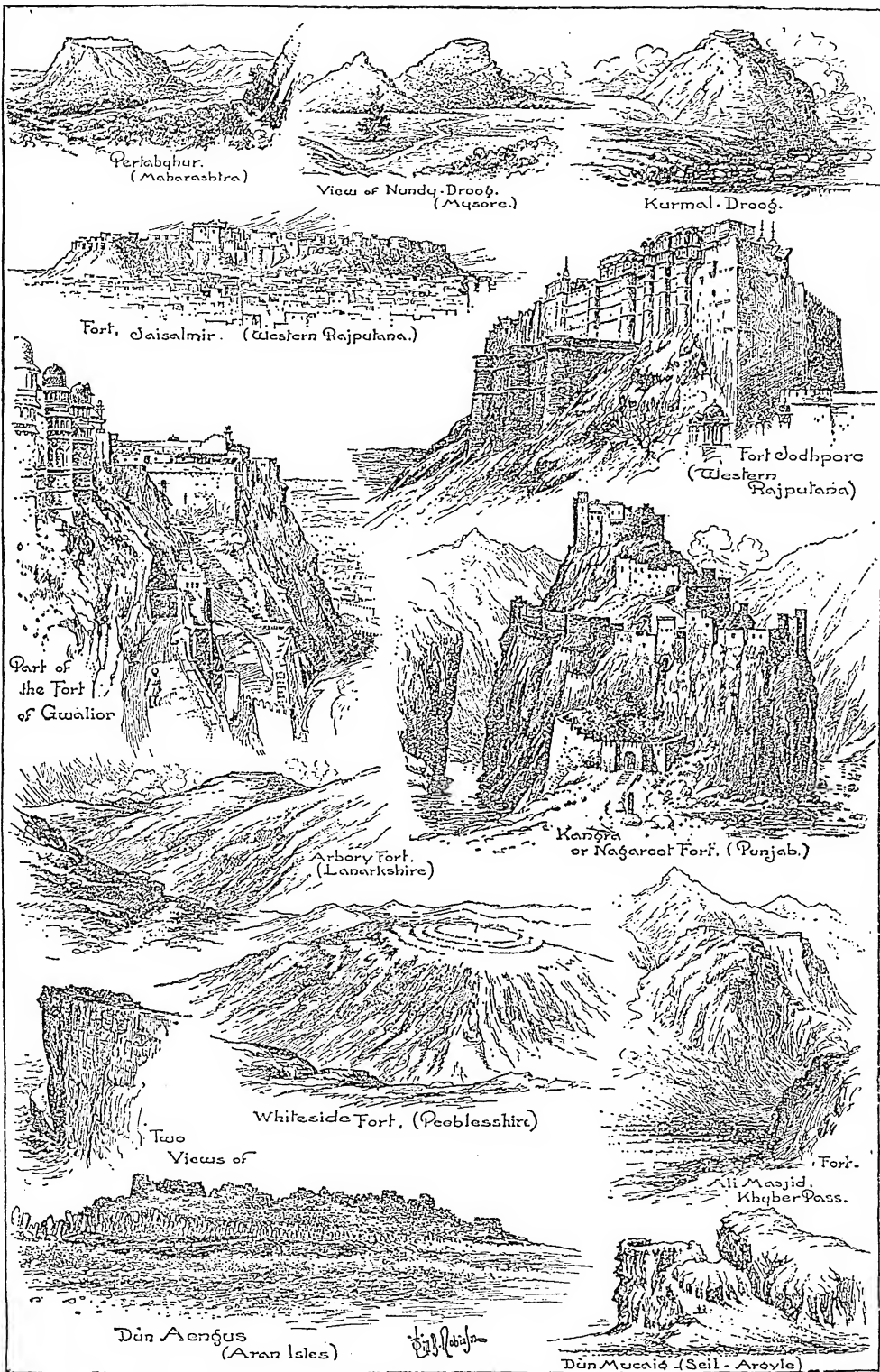
Hilden, tn. in Prussian prov. of Rhineland, 8 m. S.E. of Disseldorf, with silk and other industries. Pop. (1900) 11,296.

Hildesheim, tn. and episc. see, Prussian prov. of Hanover, 19 m. by rail S.E. of Hanover. During the 11th and 12th centuries many fine specimens of Romanesque architecture and ornamentation were erected here, and in the

15th and 16th numerous examples of Renaissance work. To the former belong the cathedral, and the churches of St. Godehard and St. Michael, the latter one of the most interesting examples in Germany. The gem of the latter period, however, is the gild-house of the butchers (1529). The Wedekind house, the Templar house, and many private residences also illustrate the German timber-framed style of building at its best. Other buildings of note are the town hall (14th century), the Römer museum, the churches of the Magdalene and St. Andrew, Trinity hospital, the Pfeiler house, and the St. Michael monastery (now lunatic asylum). Sugar, tobacco, bricks, stoves, carriages, machinery, iron-work, and bells are the chief products of the industry. Gardening and fruit-growing are prosecuted. On the Galgenberg, E. of the town, a treasure-trove of valuable Roman silver (dinner service, etc.) was discovered in 1868. Hildesheim has been a bishop's see since about the year 820. In the 15th and 16th centuries it was famous for its goldsmiths' work and its good school. Pop. (1900) 42,973.

Hildyard, SIR HENRY JOHN THORNTON (1846), British general, born near Newark. He first saw active service in the Egyptian expedition of 1882. He was present in the engagements at El Magfar and Tel-el-Mahuta, and at the battles of Kassassin (September 9) and Tel-el-Kebir. In the Boer war he first commanded the 2nd Infantry Brigade in General Buller's army, and subsequently succeeded Sir Charles Warren in the command of the 5th Infantry Division. He directed the action at Willow Grange (Nov. 22, 23, 1899). He made the frontal attack upon the Boer centre near Wagon Bridge at Colenso (Dec. 15), and was engaged in the subsequent operations for the relief of Ladysmith. When the Boers were pushed back out of Natal by General Buller, Hildyard forced the spurs between Botha's Pass and Inkvelo, and, crossing the Drakenberg Mts., secured a position which made the retention of Laing's Nek by the Boers untenable (June 8, 1900). His home appointments include that of commandant of the Staff College (1893-8) and director-general of military education (1903). In 1904 he succeeded Sir Neville Lyttelton in the command of the troops in S. Africa, with the rank of lieutenant-general.

Hilgenfeld, ADOLF (1823), German theologian, born near Salzwedel in Prussian Saxony, and became professor at Jena (1850), being an adherent of the liberal



Remains of Famous Hill-forts.

or Tübingen school of theology. Chief works: *Das Evangelium u. die Briefe Johannes* (1849); *Das Markusevangelium* (1850); *Der Galaterbrief* (1850); *Die Evangelien* (1854); *Die Propheten Esra u. Daniel* (1863); *Der Kanon und die Kritik des N.T.* (1863); *Historisch-kritische Einleitung in das N.T.* (1875). Since 1858 he has edited *Die Zeitschrift für wissenschaftliche Theologie*.

Hill, AARON (1685-1750), English poet, born in London; was author of poems, such as the *Progress of Wit* (1730), and plays. He also translated Voltaire's *Zaïre* and *Mérope* (1749), and was joint author with Bond of *The Plain-dealer* (1724). He engaged in many commercial and industrial schemes, nearly all of which resulted in failure. He held controversy with Pope, and presumed to advise Garrick, Bolingbroke, Walpole, and others.

Hill, GEORGE BIRKBECK, (1835-1903), English author, was born at Tottenham, Middlesex; the nephew of Sir Rowland Hill. He was appointed headmaster of Bruce Castle school at Tottenham, which post he held till 1876, and from that time devoted himself to literature. His principal works deal with Dr. Johnson, Sir Rowland Hill, Colonel Gordon, Dean Swift, Edward Gibbon, *Rasselas*, Rossetti, etc.

Hill, OCTAVIA (1838), English social reformer. In 1864, being struck by the miserable housing and surroundings of the poor, she purchased three cottages in Marylebone, the money for which was advanced by Mr. Ruskin. So successful was she in reforming the tenants and conducting the reform on business principles that the Countess of Ducie entrusted her with the management of property in Drury Lane. She used her influence in support of the Artisans' Dwellings Act of 1874, and actively participated in instituting and developing the Charity Organization Society, the Commons Preservation Society, etc. Her literary works are *Homes of the London Poor* (1875), *Our Common Land* (1878), etc.

Hill, ROWLAND (1744-1833), English Methodist clergyman, born at Hawkstone, Shropshire; was curate of Kingston, Somerset (1773), but was refused priest's orders by the Archbishop of York. Surrey Chapel, Blackfriars Road, London, was specially built (1783) for him, and he had thirteen attached Sunday schools, attended by over 3,000 children. He wrote *Village Dialogues* (1801; numerous editions), *Spiritual Characteristics* (1803). See *Life* by Charlesworth (2nd ed. 1886).

Hill, ROWLAND, VISCOUNT HILL (1772-1842), British gen-

eral, nephew of Rowland Hill, preacher, born at Prees Hall, Shropshire. Co-operated with Wellington in the Peninsular war, commanding brigades at Rolica and Corunna and the second division at Talavera, captured the forts at Almaraz, for which he received his peerage, fought at Waterloo, and succeeded (1828) the Iron Duke as commander-in-chief when the latter became prime minister. He was wounded at Alexandria. See *Life* by E. Sidney (1845).

Hill, SIR ROWLAND (1795-1879), originator of penny postage, born at Kidderminster. In 1833 he abandoned school teaching. The rotary press for printing newspapers was invented by him; but the government declined to permit the attachment of a machine to affix the revenue stamp. He then propounded the theory of penny postage, and invented the adhesive stamp. After very great opposition, he was (1839) attached to the Treasury for the purpose of putting his ideas into execution. The system of the penny post came into working in 1840. He was later made secretary to the postmaster-general on the Whigs again coming into office (1846). He likewise interested himself in the colonization of S. Australia and in Owen's socialistic schemes. He died at Hampstead, and was buried in Westminster Abbey. He wrote *Plans for the Government and Education of Boys* (1822); *Home Colonies* (1832); *Post-office Reform* (1837); *State and Prospects of Penny Postage* (1844). See *Life* by G. B. Hill (1880).

Hillah, or HILLA, tn., vilayet of Bagdad, Turkey in Asia, on r. bk. of the Euphrates, a little S. of the ruins of Babylon, from which most of its building material was taken. It manufactures silk, cotton, and woollen goods. Pop. 10,000.

Hillel, called HABABLI ('the Babylonian'), and HAZZAKEN ('the Elder'), doctor of the Jewish law, lived in the 1st century B.C. His teaching was much in the spirit of the sermon on the mount. Proceeding to Palestine, he became the head of a liberal school for the interpretation of the law, and as such was opposed to Shemaia. He was the first to collect the traditions of the oral law, the Mishnah, and he introduced the Probol, whereby the privilege of the nullification of debt in the Sabbatical year is waived. See Trénel's *La Vie d'Hillel l'Ancien* (1867), and Delitzsch's *Jesus und Hillel* (3rd ed. 1897).

Hiller, FERDINAND (1811-85), musical conductor, pianist, and composer, born at Frankfurt-on-Main. After touring (1827) with

his master, Hummel, he went (1829) to Paris, and there popularized the works of Bach and Beethoven. Then he acted (1847-50) as music director of Düsseldorf. But his permanent reputation rests on his work at Cologne (from 1850) as founder of the conservatorium, of which he was director, conductor, and professor; also as director of the musical festivals there. He was enthusiastically received at London, Liverpool, and Manchester in the seventies. Works: Chamber music; two oratorios (*The Destruction of Jerusalem* is one of his finest compositions); six operas, etc. He won a high reputation as a musical critic, as the biographer of Beethoven (1871) and of Mendelssohn (1874), and as the author of *Aus dem Tonleben unserer Zeit* (1868-71), *Künstlerleben* (1880), and *Erinnerungsblätter* (1884).

Hill-forts. Hill-tops, like remote islands, jungles, and fens, are often the last refuges of a native race retreating before the invader; and the natural defences of such retreats are strengthened by artificial means. Hill-forts, however, may, in many cases, be the strongholds not of conquered aborigines, but of a ruling caste of predatory warriors, whose hold upon the fertile plains occupied by husbandmen and townfolk is fitful and precarious. Such are the hill-forts of the wild tribesmen of Afghanistan and the north-western border of India. The wide territory of Rajputana is dotted over with eminences crowned with well-built fortresses of stone, of which Chitor in Udaipur offers a striking example. Akin to them were the rock-fortresses of the robber barons of mediæval Europe, or, earlier still, such a citadel as that of 'lordly Volaterræ' in S. Italy. The rude earthworks that top many of the peaks of the British Isles, especially in Scotland, usually consist of two or three concentric ramparts of stone and earth defending the crest, or sometimes the rounded shoulder, of a hill; the ground plan of the area thus fortified being oblong, circular, or oval. In a number of cases (Dr. Christison has noted fifty-three) the stone-work of their walls has been vitrified. (See VITRIFIED FORTS.) A fine specimen of the Scottish hill-fort is that which crowns the 'White Caterthun,' near Brechin in Forfarshire. The hill itself rises to a height of 976 ft. above sea-level. A double intrenchment, encircling the hill 200 ft. below the summit, offers the first resistance to assailants; and when it is passed, the peak rises so abruptly that access to it can only be gained at one side. The summit is surrounded by an oval

rampart of stones 436 ft. long by 200 ft. in width, the walls being 26 ft. thick. In the walls are the remains of numerous chambers, as in the Irish 'cashels.' See Christison's *Early Fortifications in Scotland* (1898).

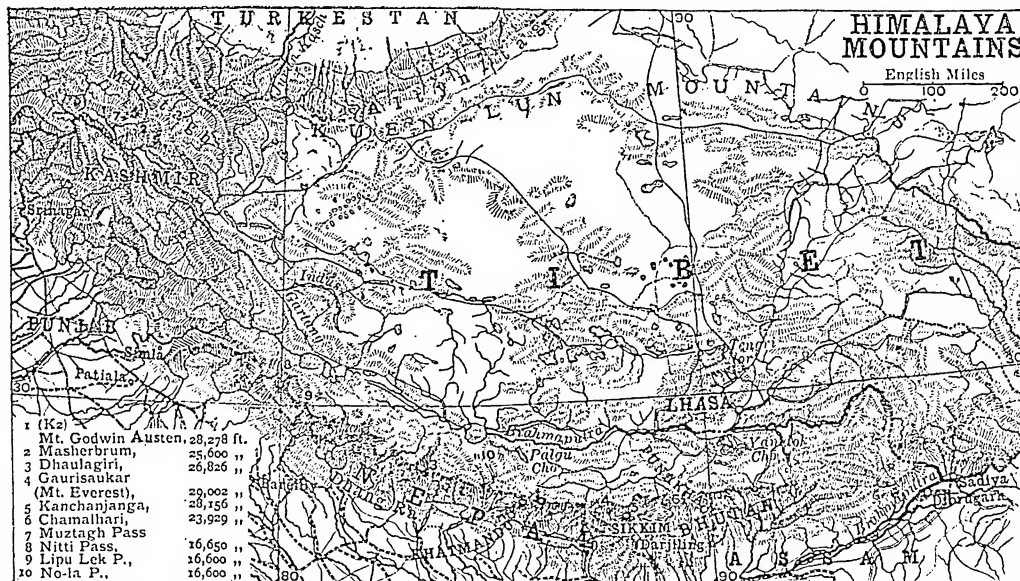
Hilliard, HENRY WASHINGTON (1808-92), United States lawyer, born in Fayetteville, N. Carolina; was elected to the Alabama legislature (1838), and seven years later to Congress. He was *chargé d'affaires* in Belgium and United States minister in Brazil. His *Politics and Pen Pictures* (1892) is a sort of autobiography.

Hillsborough, or HILLSBORO, vil., cap. of Hill co., Texas, U.S.A., 55 m. s.w. of Dallas; has lumber trade and manufactures of cotton. Pop. (1900) 5,346.

Himalayas (Sans. *him*, 'snow' or 'cold'; *ālaya*, 'abode'), the name given by the Aryan immigrants into the plains of Upper India to the snowclad ranges which bounded their vision to the north. Geologically, these ranges are merely the southern and western face of the great central Asian upheaval, bounded on the N. by the Kuenlun range, which, with the Himalayas and their offshoots, supports the great tableland of Tibet. Geographically, the name may be held to include the mountain system lying between the southward bend of the Indus (in 75° E. and 36° N.) in the W., and the southward bend of the Tsangpo, or Brahmaputra (in 94° E. and 30° N.), on the E. The area thus

a slight southward inclination, continuing as far as the Dihong or the Brahmaputra.

Subdivisions.—Throughout the greater part of their length the Himalayas form a system, not a chain, of mountains. East of the Ganges the sub-Himalayan tract is distinguished by a damp and forest-clad belt, called the Tarai, backed in some places by the Bhabar, a narrow and dry strip of scrub. This feature is absent from the drier sub-Himalayan tracts W. of the Jumna. The sub-Himalayas or outworks of the system, known for a considerable portion of their length as the Siwalik, rise from the plains to the height of from 2,000 to 3,000 ft. above the sea, and skirt the main ranges from



Hilo, tn. and seapt., Hawaii I., on E. coast, on Hilo or Byron Bay; exports sugar, molasses, arrowroot, and rice.

Hilton, JOHN (1804-78), English surgeon, born at Castle Hedingham, Essex. Appointed demonstrator of anatomy at Guy's Hospital, London (1828), he became assistant surgeon (1844), full surgeon (1849), professor of surgery in the Royal College of Surgeons (1859), and president of the college (1867). His writings include *On Rest and Pain* (1863), *Notes on the Functional Relations of the Cranium* (1855), and *The Hunterian Oration* (1867).

Hilversum, tn., Netherlands, prov. N. Holland, 18 m. by rail S.E. of Amsterdam, of which it is a residential suburb. It has textile industries. Pop. (1899) 19,443.

included extends about 1,600 m. in length, with an average breadth of about 200 m., increasing towards the N.W. to nearly thrice that distance. A large portion of the system is still (1905) *terra incognita*, especially on the Tibetan side, and in Nepal and Bhotan.

Direction.—Starting from the great mass abutting upon the Pamir to the W., and the Kuenlun on the E., the main direction of the system is N.W. to S.E., across Kashmir from the Indus to the head-waters of its chief tributaries, in 79° E. and 31° N. Here the chief ranges diverge into two nearly parallel lines, throwing out numerous spurs, also parallel to each other, at a more or less acute angle to their principal direction. The system then trends almost W. to E., with

the Brahmaputra to the Indus. The Outer Himalayas rise either immediately behind the first line, or are separated from it by a valley, often of considerable extent. They are usually from 8,000 to 9,000 ft. in elevation, and about 60 m. in breadth. From the Indus, however, to the watershed of its tributaries N. of the Sutlej, this portion of the system reaches the exceptional height of 15,000 ft., and bears the name of the Pir-Panjal, or Dhaulidhar range. Along the Outer Himalayas are placed most of the hill-stations of Europeans—Marri, Dalhousie, Simla, Masuri, Naini Tal, Darjiling, and so on. Above the Outer range tower the Central Himalayas, a mass of undetermined breadth and considerable irregularity of direction. The highest peaks, moreover, are not

found upon the main axis, but mostly as terminals to some of the numerous spurs referred to above. The mean height may be taken as about 20,000 ft. For so mighty a rampart a fitting bastion presents itself in Nanga Parbat, which rises abruptly from the Indus valley, at 3,000 ft. above the sea, to more than 26,000 ft. Several peaks of over 22,000 ft. surround it. About the deep gorge which the Sutlej has worn for itself through the Himalayas the range widens into a second cluster of stupendous summits, flanked by extensive glaciers, the gathering-ground of the Gangetic system, and in that capacity invested by Brahmanic mythology with many sacred traditions and attributes. Badrinath, Kedarnath, Gangotri, Jamnotri, and Nanda Devi, all from 22,000 to 25,000 ft. high, are among the peaks which thus overhang the shrines of Garhwal and Kumaun. It is between the Sutlej and the confines of Bhotan that the southern range of the Himalayas, if not its northern extension also, attains the greatest and most sustained elevation. In Nepal several peaks of more than 25,000 ft. have been observed w. of Mt. Everest, the culminating point of the Himalayas. The measured height of Everest is 29,000 ft. To the E. of Everest, on the frontier of Sikkim, rises Kanchenjunga (or 'the Lord of Great Snows'), whose 28,156 ft. place it second to Everest alone in the Himalayas proper, and third in the whole system; for in the far Muztagh the peak long known in the maps as K², but now called Godwin-Austen, has been found to reach 28,278 ft. In both Sikkim and Bhotan peaks of from 23,000 to 25,000 ft. have been observed. The southern chain dips throughout on its northern side in a series of synclinal steps to a level of some 15,000 ft., from which the northern main range rises. Between this, again, and the Tibetan plateau there intervenes from 82° E. to 94° E. the valley, or gorge, of the Tsangpo, which, starting at about 15,000 ft., falls to little more than 500 ft. by the time it enters Upper Assam. West and N.W. of the head-waters of the Tsangpo the Himalayan system tends to merge more directly into the Tibetan plateau. The Muztagh ranges originate in the Pamir, from which they are separated by the Hunza and Gilgit valleys. The greatest elevation is attained near the point of origin, N. of the Indus, where several peaks of more than 25,000 ft. surround Mt. Godwin-Austen. From thence the system trends E. by the Karakoram chain, and after entering the Tibetan

plateau, bends S.E. to Kailas, a peak of 22,000 ft. This portion of the system is distinguishable from the Central Himalayas by its glacier system, and by the relatively great slope exposure of its highest summits. The Biafo glacier, for example, runs for some 90 m., mostly between walls from 20,000 to 25,000 ft. in height; and several other glaciers have been explored for more than 50 m.

Passes.—The routes across the Himalayas are comparatively few, and undoubtedly difficult. Nevertheless, those across the Karakoram and the central range into Kashmir, as well as those from S. Tibet into Nepal and Sikkim, are considerably used by traders. The passes of the chief ranges seldom fall below 18,000 or 19,000 ft. The main difficulty, apart from that of maintaining the track, lies not in the altitude, but in the vast breadth of the mountainous region, and, on the northern side, the extent of inhospitable country, semi-arctic in its conditions, for the crossing of which provision has to be made from a distant base of supplies. The mean snow-line on the Indian slope of the Himalayas runs at about 15,000 ft. On the northern side it rises to 18,000 ft., and in the Karakoram to 20,000 ft. All transport, accordingly, has to be drawn from the northern highlands by the yak and the Tibetan sheep and goat. The trade is necessarily of a light character. Borax, goats' hair, and narcotic preparations of hemp are brought into India; and cotton or woollen piece goods, leather, arms, and ammunition form the main loads back into Tibet and Turkestan.

Hydrography.—As between the Indian river system and that of Central Asia, the parting of the waters is effected by the Karakoram Mts. and their extensions. In the case of the Gangetic system, while the Jumna and the Ganges both take their rise to the S. of the central range, the tributaries E. of these originate considerably to the N., as does the Subansiri, the most important of the Indian contributions to the Brahmaputra. The main range, accordingly, is but a subordinate watershed which these streams have pierced. The actual parting runs very near the southern wall of the Tsangpo valley, well N. of the highest summits.

Geology.—The whole system in its present conformation appears to have been the result of movements beginning after the Cretaceous period, and reaching their maximum in extent and violence in the Pleiocene. The main ranges were probably in existence at the latter period,

though much lower than at present, and from Assam westwards must have been repeatedly submerged and re-elevated up to the beginning of the Tertiary period. In the upheavals the rocks were crushed and folded into the ridges and irregular lines of the parallel anticlinals which now sustain the higher summits. The sea was driven from the N.W., and by a subsequent depression the Gangetic river system was separated from that of the Indus, and the Assam ranges from the allied formations of the Eocene period, to which those of peninsular India belong. West of Assam, again, marine deposits have been found up to a height of 20,000 ft., but none farther E. A considerable line of trap intrusion, reaching 20,000 ft. in height, along the S. bank of the Upper Indus, and far N. of the main range, establishes the link with the Tertiary formations of the Siwalik, the latest effort of the upheaving influences, and indicates the comparatively late elevation of the N.W. Himalayas, and the obliteration of previously existing mountain tracts.

See Waddell's *Among the Himalayas* (1899), Conway's *Climbing and Exploration in the Karakoram* (1894), Freshfield's *Round Kanchenjunga* (1903), C. F. Gordon-Cumming's *In the Himalayas* (1884), and F. B. Workman's *In the Ice-world of Himalaya* (1900).

Himeji, tn., cap. of prov. Harima, Hondo, Japan, 30 m. N.W. of Kobe; produces cotton and stamped leather goods. It has an ancient castle. Pop. (1898) 35,282.

Himera, anc. city of Sicily, Italy, on the N. coast, 14 m. S.W. of Cefalu; was in 480 B.C. the scene of the defeat of the Carthaginian Hamilcar by the Sicilian Greeks under Gelo; but the city was destroyed in 409 B.C. by Hannibal, grandson of Hamilcar.

Himyaritic Language. See **SABEANS**.

Himyars, or **SABEANS**, former people of Yemen, Arabia, the Homerites of Ptolemy. See **SABEANS**.

Himayāna, or the **LESSER VEHICLE**, one of the two sects or schools of religious and philosophical learning in northern Buddhism (the other being the **Māhayāna**, or **Greater Vehicle**). The doctrines of this school were less elevated than those of the **Greater Vehicle**, nor did they hold the same books as canonical; they denied a personal soul and a personal God, but the **Māhayāna** admitted the latter. Saint-Hilaire, in his book *The Buddha*, says: 'Chinese authors generally admit that the partisans of the **Little Vehicle** cannot attain Nirvana, and are still subject to

transmigration. They do not attain true metaphysics, but are content with the code of morals and discipline, to which they add the legends. This is evidently an inferiority which adherents of the Little Vehicle strive in vain to hide.' Hwen-t'sang, the Chinese monk of the 7th century, wrote a treatise in refutation of the errors of the Lesser Vehicle.

Hinckley, mkt. tn., 13 m. s.w. of Leicester, England, and on Watling Street, with industries of hosiery, boots, shoes, and coarse pottery. There are mineral springs. Pop. (1901) 11,304.

Hincmar (c. 806-882), archbishop of Rheims from 845. He strenuously resisted the encroachment of the royal (Frankish) power in ecclesiastical matters, and maintained, not less strenuously, against popes and kings the independence of the Frankish Church. His *Annales Bertiniani* cover the period 861-882, and his other works (*Epistole*, etc.) were collected by Sirmond the Jesuit in 1645. See Prichard's *Life and Times of Hincmar* (1849), and *Life*, in German, by Schrörs (1884).

Hind, JOHN RUSSELL (1823-95), English astronomer, was born at Nottingham. He early entered the royal observatory, and took charge, from 1844, of Bishop's observatory in Regent's Park, London, where he discovered ten asteroids, two comets, the temporary star of 1848, etc. He observed in Sweden the total eclipse of July 28, 1851, and superintended the publication of the *Nautical Almanac* from 1853-91. He published *The Solar System, The Comets, and An Introduction to Astronomy*.

Hindley, tnsnip. 2 m. S.E. of Wigan, Lancashire, England; famous for cannel coal, and has cotton mills and iron works. Pop. (1901) 23,504.

Hindmarsh, suburban post tn., on Torrens R., 2½ m. by rail N.W. of Adelaide, S. Australia. Pop. 10,500.

Hindö, isl. off w. coast of Norway, Nordland co., separated from the rest of the Lofoten group by Raft Sound. Area, 864 sq. m.

Hinduism is commonly used to include Brahmanism, but in this article it is confined to those complex religious systems which were evolved out of the Vedic worship of the one supreme being (Brahma). Pure Brahmanism is monotheistic; Hinduism is polytheistic. Yet Hinduism is the offspring of Brahmanism. The doctrine of the Trimurti, or trinity, embraces the triple manifestation of the godhead as Brahma the creator, Vishnu the preserver, and Siva the destroyer.

In theory the Trimurti is acknowledged, but in practice worship is confined to one god. At

the present day, outside the modern Unitarian churches of India, which claim to have reverted to pure Brahmanism, the worship of Brahma is confined to a comparative handful of Hindus. Siva, the third person of the trinity, has been elevated to the position of Mahā-deva (the great god). He destroys, but in destruction there is regeneration or transmigration, and in transmigration there is hope. For this reason Siva has more devotees than Brahma. But he has to be approached with fear and trembling, and is altogether too severe and stern a deity for the multitude; therefore in Vishnu, kind and gentle, we have the popular god of the Hindus. He identifies himself with man, inspires confidence, devotion, and love. Broadly speaking, then, we have in Siva the elements of austerity and devotion to duty, and in Vishnu the humanities of life. This brings us to Sivaism and Vishnuism, the essence of modern Hinduism—not opposite and incompatible creeds, but representing different lines of religious thought, separated by a gulf as wide as that which divides the Romanist from the Protestant. But as the powers of the three persons of the Trimurti are co-equal, so their characters are interchangeable. Accordingly, at times, deliverance from one god is sought at the hands of another, or it may be of the same god under a different incarnation.

Another complication is due to the introduction of the female element. Each incarnation of the deity has his *sakti* (female counterpart or wife), and we have further division—the 'right-hand worshippers,' whose favourite deity is male, and 'left-hand worshippers,' devotees of goddesses. The attitude of Hinduism towards other faiths is tolerant, or one of indifference. The influences of the Christianity which the Hindu hesitates to accept are certainly making themselves felt in many directions, notably in the amelioration of the condition of women.

The Hindu is before all things religious. Through gross conceptions, it may be, he stretches 'lame hands' to the divinity. The passer-by notes shrines and altars lining the highways of India. Trees, rivers, and cities are sanctified by some past visitation of a favourite god. The implements of husbandry are consecrated before use 'to him who gives the increase,' and become objects of worship. See Lyall's *Natural Religion in India* (1891), and Arnold's *Hinduism* (1905); also bibliography under BRAHMANISM.

Hindu-Kush, a westward prolongation of the Himalayas, from

which it is separated by a gorge of the Indus R. Stretching s.w. from the Pamirs for over 350 m., and having a breadth of 200 m., a series of ranges, running parallel with each other, are spread over the N.E. angle of Afghanistan, and throw out many spurs towards the S. These mountains are crossed by several passes, three of which may be noted. The Wakhjir, at the N.E. extremity, marks the junction of British, Afghan, and Chinese spheres; the Bamian, or Irak, forms the trade route between India (Chitral) and Central Asia; and the Khawack (13,000 ft. high) connects Badakshan and Kafiristan. Tirach Mir (25,400 ft.), on the frontier of Chitral, is the highest peak.

Hindu Law. It is claimed for Manu, the Hindu lawgiver, that he received the commandments from the deity. The precepts which he promulgated were at length amplified in 'commentaries,' which, though not received as divinely inspired, were yet recognized as the work of Brahman experts. These 'commentaries,' most of which were compiled between the 11th and 15th centuries, are so coloured by local conditions and local customs (which to this day in India are strong enough occasionally to supersede the written law) as to differ markedly from each other; and Bengal and Western India, Benares and Southern India, have each their separate 'schools.' The subjects dealt with are almost entirely confined to matters of caste, questions of property, inheritance, succession, adoption, and maintenance, and the laws relating to marriage, divorce, etc.; they concern the family and the individual more than the community. In 1772 Warren Hastings made an effort to codify Indian law, Hindu and Mohammedan. The conservatism of the people and the sanctity of the origin of Hindu law have not, however, prevented it from being modified to some extent under the influences of Western law. If Manu be literally interpreted, all sons should share equally in a deceased father's estate; yet not a few Hindus dispose of their property by will as they please. The territories of native chieftains, once treated as private property, are no longer divisible. The suppression of sati was an important departure from a principle which had all the weight of a divine ordinance. And although the majority of Hindus still view with repugnance the marriage of their widows, an act passed by a British legislature has legalized the remarriage of Hindu widows.

Hindustan, British first-class battleship of the King Edward VII. class, launched at Clydebank in December 1903; displacement, 16,350 tons; speed, 18½ knots.

Hindustan ('the country of the Hindus'), a term sometimes applied to British India generally, or to that part of it which lies between the Himalaya and Vindhya Mountains, from the Punjab in the W. to Bengal in the E. This term is now seldom used.

Hinganghat, tn., Wardhadist., Central Provinces, India, 48 m. S.W. of Nagpur. Wardha valley is noted for its raw cotton, and Hinganghat is the centre of the trade. Pop. (1901) 12,662.

Hingham, tn., Plymouth co., Massachusetts, U.S.A., on Massachusetts Bay, 17 m. S.E. of Boston; is a fashionable summer resort. Until 1635 it was known as Barecove. Pop. (1900) 5,059.

Hinkson, Mrs. See TYNAN, KATHARINE.

Hinnom, THE VALLEY OF. See GEHENNA.

Hinny, the hybrid offspring of a stallion and a female ass. It is less common, because less valuable, than the cross between a mare and a male ass. (See MULE.) It is smaller than the mule, and inferior in strength, but in mental characteristics takes after the male parent, and is therefore less obstinate and more docile.

Hinojosa del Duque, tn., prov. Cordova, Spain, 48 m. N.E. of Cordova. It has rich copper mines, and manufactures linens and woollens. Pop. (1900) 10,673.

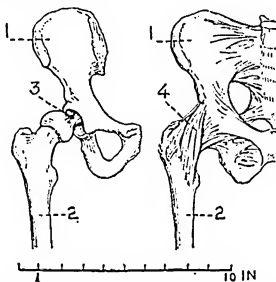
Hinterland. The notion that the region beyond and behind that occupied by colonists or traders belongs to them by right, because necessary for expansion and growth, was in the minds of some of the very earliest colonists; and the attempt of the French to appropriate the great Mississippi valley from Canada was the cause of almost incessant warfare on the frontier. The English colonists claimed that all the land to the west was theirs in virtue of their natural right, although at the time they were occupying but a fraction of the land east of the Mississippi. The doctrine reappeared in S. Africa when, in 1884, Cecil Rhodes demanded that the imperial authorities should annex Bechuanaland and Stellaland, to preserve the right of the colony to expand towards the north. The doctrine received its German name, and its most striking application, from the sudden development of the desire of the Germans for colonies in the days of Bismarck.

Hinton, JAMES (1822-75), English aural surgeon and philosopher, was born at Reading. He became (1850) aural specialist in

London, lecturer at Guy's Hospital (1863-74), and was author of *An Atlas of Diseases of the Membrana Tympani*, *Questions of Aural Surgery*, and *The Place of the Physician* (1874). His philosophical writings include *Man and his Dwelling-place* (1859), *The Mystery of Pain* (1866), and *Chapters on the Art of Thinking* (1879). That God was 'universal Spirit,' man united to him by 'altruism,' organic form 'motion in the direction of least resistance,' were of the essence of his thought. His *Philosophy and Religion* (1881) and *The Lawbreaker and the Coming of the Law* (1884) appeared posthumously. See *Life and Letters* (1878), by Hopkins.

Hingo. See HYGO.

Hip-joint. The hip is an enarthrodial or ball-and-socket joint, the rounded head of the thigh bone or femur fitting into the acetabulum, a cup-shaped socket on the outer aspect of the haunch bone.



Hip-joint, front and back view.

1, Haunch bone; 2, femur; 3, round ligament; 4, capsular ligament.

Diseases and Injuries.—The commonest ailment of the hip is strumous disease, which may arise from some slight injury, such as a bruise, but which ultimately shows characteristic tubercular infection of the synovial membrane or of the bone. As a rule it commences in childhood, and is accompanied by slight pain. Lameness, altered position of the limb, and loss of mobility are always present, but may be considerably disguised by the patient walking with his pelvis tilted into an abnormal position. In the early stage, pain and tension of the joint are relieved by the abduction of the limb from the middle line of the body. Later, reflex irritation of the powerful adductor muscles fixes the hip in a position of adduction, and were the pelvis level the limb would lie across the sound thigh. Should the disease remain untreated, it is apt to become progressively worse, until the joint becomes disorganized, and tubercular invasion of other organs may follow. The treatment must be directed

to securing rest of the diseased joint, and separation of the inflamed surfaces, by means of splints, crutches, and a raised sole on the sound foot, so that the affected limb is kept from the ground. The general health should be most carefully looked after, and liberal diet, with tonics, cod-liver oil, fresh air, and moderate exercise, are of extreme importance. Should pus be present, free incision and drainage are necessary; and if the joint be greatly damaged, excision may be advisable.

A disease attacking the hip in older patients is rheumatoid arthritis, sometimes called morbus coxae senilis, in which considerable masses of bone are deposited around the joint, so that it becomes fixed and useless. Treatment as for chronic rheumatism occasionally ameliorates the condition, but in most cases the disease gradually becomes worse with advancing years.

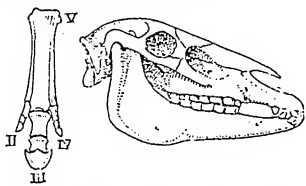
Dislocation of the hip-joint is not uncommon, and in old people it is frequently accompanied by fracture of the neck of the femur. In simple dislocation reduction is rendered difficult by the contraction of the powerful muscles around the joint, but manipulation, under chloroform if necessary, generally suffices to make the head of the femur return to the acetabulum along the course it pursued at the time of the accident. Subsequent rest for five or six weeks, with cautious passive movements during the last half of that period, must then be resorted to. Congenital dislocation is sometimes found in children, and is occasionally double. For this condition a method of treatment known as Lorenz's, or bloodless, has acquired undue notoriety from the unhappy results that have followed its employment.

A very persistent and troublesome affection of the hip-joint frequently occurs as a symptom of hysteria, and is characterized by pain, by tenderness, and often by lameness. Its treatment does not differ from that of other manifestations of hysteria.

Hipparchus. See HARMODIUS. Hipparchus, the greatest of Greek astronomers, observed in Rhodes from 160 B.C. He invented trigonometry, discovered the precession of the equinoxes, originated our present system of geographical co-ordinates, and employed eccentrics and epicycles to explain the celestial movements. His catalogue of 1,080 stars is preserved in Ptolemy's *Almagest*. Of his other works, only the commentary on the *Phænomena* of Aratus survives; critical ed. and German trans. by Manitius (1894).

Hipparion

Hipparion, one of the fossil ancestors of the horse, the remains of which are found in the Pliocene strata of Africa, India, and China, and in the Upper Miocene of N. America. It was about four feet high at the shoulders, and had lateral toes on each side of the feet, which were complete though small. The ulna and fibula, however, were imperfect, and the lateral 'splint bones' apparently did not reach the ground. It is a somewhat more advanced type than *Anchitherium* or *Prothippus*, especially in the dentition.



Hipparion: left fore foot and skull.

(The numbers refer to the toes present.)

Hippias. (1.) See **HARMODIUS**. (2.) **HIPPIAS OF ELIS**, a sophist of ancient Greece during the 5th century B.C. He spent the greater part of his life in travelling about Greece, lecturing on a variety of subjects, particularly economics, ethics, and politics. He is introduced as a character in Plato's *Hippias Major* and *Hippias Minor* (though the latter is probably spurious).

Hippocampus, a name applied by the Greeks to the mythical sea-horse, is used as a generic term for certain curious little fishes having a head somewhat resembling that of the horse. The sea-horses belong to the same order as the pipe-fish (*Lophobranchii*, or 'tufted gills'), and have compressed bodies and prehensile tails devoid of a caudal fin. They are in the habit of coiling their tails round weed or some other object, and are often carried great distances in this way. *Hippocampus antiquorum* occurs off the south of England. The sea-horses are widely distributed, and some forms present a striking resemblance to seaweed.

Hippocrates, ancient Greek medical man, was a member of the medical family of the *Asclepiade*. He was born in the island of Cos, probably about 460 B.C., and there he lived and practised, though he travelled widely in Greece, and died at Larissa, in Thessaly. In his medical practice he was cautious, trusting chiefly to the operations of nature, and to the effects of diet and regimen. As to surgery, his maxim was, that 'what cannot be cured by medicine must be

Hippomenes

Hippolyte, in ancient Greek legend, was queen of the Amazons. She possessed a girdle, the gift of her father Ares, in quest of which Hercules came and slew her. Another tradition tells that she and the Amazons invaded Attica, but were conquered by Theseus, who married her.

Hippolytus, in Greek story, was the son of Theseus by Hippolyte or Antiope. Having been unjustly accused by his step-mother Phædra, he was cursed by his father, who called upon Poseidon to destroy him; and the god sent a sea-monster, which terrified the horses of Hippolytus as he was driving along the seashore after he left Troezen, and he was dragged along by them and killed. Afterwards his innocence was proved to Theseus. Italian tradition said that Artemis restored him to life, and placed him under the care of the nymph Egeria in Latium. The story is dealt with by Euripides in his *Hippolytus*, which has been imitated by Racine in his *Phædre*.

Hippolytus (c. 160-236), Christian writer, is supposed to have been born in the East, and to have died in exile in Sardinia; but the facts of his life are little known. He is believed to have been a disciple of Irenæus at Lyons, and he was at one time a presbyter at Rome, or, according to some writers, bishop of Rome, in which case he was the first antepope. In 1842 a manuscript of a refutation of all the heresies was discovered, and afterwards (1852) published. The authorship of this treatise was long in dispute, but it is now

cured by the knife; what cannot be cured by the knife must be cured by fire.' Only a small portion of the works ascribed to him is certainly his. He was a thoroughly scientific inquirer, free from prejudice and superstition, and desirous only of the truth. But he was more than a physician; he was a great writer, whose work abounded with maxims such as the well-known 'Life is short, art is long.' He classified the fluids or humours of the body as blood, phlegm, black and yellow bile, the right combination of which resulted in health, and any disturbance of it in disease. His most important genuine works are *Prognostics*; *Aphorisms*; *Of Epidemic Diseases*; *About Air, Water, and Places*; and *Wounds of the Head*. The best edition of his complete works is that of E. Littré (10 vols. 1839-61), including Greek text and French trans.; but that by Ermerius (Greek text and Latin trans., 1859-63) is also good. English trans. of genuine works by F. Adams (1849). See Sourlangas' *Étude sur Hippocrate* (1894).

Hippocrene. See **HELICON**.

Hippodamia. See **PELOS**.

Hippodrome, the ancient Greek course for chariot-racing or horse-racing. It was oblong, with a semicircular end. The competing chariots or horses had to round a pillar or other mark at the farther end, and return to the starting-point; this turn was the critical point of the race, as may be seen from the descriptions of chariot-races in the *Iliad* and in the *Electra* of Sophocles. One of the most famous was that at Constantinople (now At-meidan), begun by Septimius Severus and finished by Constantine the Great.

Hippodrome, London, a popular place of amusement, was opened on Jan. 1, 1900. Since then similar buildings have been erected in the largest provincial centres, as well as in the United States. The entertainment is a combination of circus, hippodrome, and theatre. One of its most original and attractive features is the aquatic display, which forms the *pièce de résistance* of each performance. This takes place in the arena, which, by means of an ingenious mechanical device, is converted into a tank with a holding capacity of one hundred thousand gallons of water and an average depth of eight feet.

Hippogriff, or **HIPPOGRYPH**, a fabulous animal, represented as having the winged body of a horse with the head of a griffin. It is a comparatively modern invention, and is described as the horse of the muses. The figure was much used during the renaissance



Hippogriff.

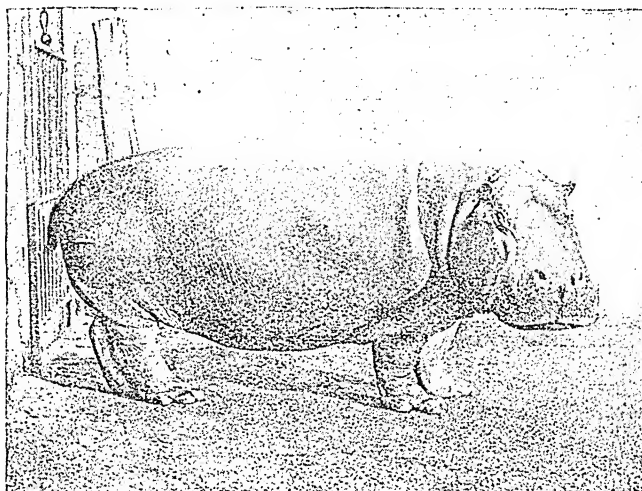
generally assigned to Hippolytus. The work throws much light on early church history, and is not favourable to many of the Roman claims. It is highly valued by Protestants. An edition of his works by Lagarde appeared in 1858. See Döllinger's *Hippolytus and Callistus* (1853; Eng. trans. 1876).

Hippomenes. See **ATALANTA**.

Hipponax, a Greek iambic poet of the 6th century B.C. He was expelled by the tyrants of his native city, Ephesus, on account of his love of liberty, and settled at Clazomenae. His poems were mostly satirical. He is especially famous as the inventor of a new kind of iambic verse, called the Hipponactean or Seazon—i.e. limping. Only a few fragments of his works are extant, printed in Bergk's *Lyrici Graeci*.

Hippopotamus, a large African artiodactyle mammal, belonging to the division Suinae, or piglike forms. The bulky body may reach a length of over fourteen feet, with a height at the shoulders of three feet eight inches. The legs are very short and thick; the head enormous, with an angular and expanded muzzle; the body deep,

its time floating at the surface, or walking about at the bottom of the water, rising at intervals to breathe. The animals are nocturnal in habit, being drowsy and languid during the day; but at night they quit the water to graze on the banks. In cultivated regions they often cause great damage to crops. The diet is purely vegetarian. Usually only one calf is produced at a birth, and is carried by the mother on her back. The hippopotamus lives well in captivity, and can be readily induced to breed. It is hunted for the sake of the hide, which is of enormous thickness, and for the fat, the ivory being now little esteemed. The flesh is much appreciated by the natives, who in some places hunt the animal with harpoons,



Hippopotamus.

(Photo by Gambier Bolton, F.Z.S.)

so that when the animal walks on soft mud the under surface touches the ground. The tail is short and compressed, the eyes small but projecting, the ears rounded; both ears and nostrils can be closed at the will of the animal. Each foot bears four toes, which are almost equal in size, and all touch the ground in walking; the central toes have not their inner surface flattened, as in the pigs. The toes are partly connected by webs. The skin is nearly naked, bearing only a few bristles. As regards the teeth, the canines are well developed, and continue growing throughout life. Formerly widely distributed throughout the rivers and lakes of Africa, the common hippopotamus (*H. amphibius*) now occurs only between 17° N. lat. and 25° S. It is essentially an aquatic animal, spending most of

as was done by the ancient Egyptians. In W. Africa there occurs the pygmy or Liberian hippopotamus (*H. liberiensis*), a small animal not larger than a pig. It is less aquatic in its habits than the common form, and seems to inhabit swamps and damp forests. A considerable number of fossil species of Hippopotamus are known, and the common species appears formerly to have ranged through Europe to England as far north as Yorkshire. Its remains are frequently found mingled with those of the reindeer.

Hippo Regius. See BONA.
Hippuric Acid, benzamido-acetic acid, $C_6H_5CO.NH.CH_2COOH$, occurs in the urine of the Herbivora, and may be prepared synthetically by heating benzoic anhydride with amido-acetic acid. It is a colourless, crystalline solid, and dissolves readily in hot water.

Hippuritids, a group of extinct Mollusca, which are known only from Cretaceous strata, especially in the Mediterranean area. The two valves of the shell were dissimilar, the lower (right) valve being large, often conical or cup-shaped, while the smaller (left) valve was flattened, small, and served as a lid to close the orifice of the cavity in the other. The hinge was large and strong, with powerful teeth, and large, prominent ridges for the attachment of the muscles. The shells were mostly attached to the subjacent rocks by the apex of the under valve, and were often a foot or more in length. Moreover, the interior cavity was more or less filled up by a mass of spongy, calcareous tissue, resembling the cells of a honeycomb. The usual shape was that of a horn, straight or somewhat curved, and closed above by the small, lidlike left valve. The outer surface was ornamented with ridges and furrows. Many genera are known (Radiolites, Sphaerulites, Hippurites, etc.), and they show considerable diversity in the details of their structure, though conforming to the same general type. They do not appear to be closely related to any living bivalve molluscs, except it be to Chama. The great hippuritid limestones are found in the Western and Eastern Alps, Dalmatia, Greece, Asia Minor, Arabia, and the Himalayas.

Hipurinas, S. American aborigines, widespread in W. Brazil. Till lately they were unreclaimed savages, addicted to cannibalism and warfare. The Protestant missionaries have reduced their polysynthetic language to written form, and published a grammar and vocabulary in the *Anthropological Journal* for 1894. The Hipurinas use bark canoes and poisoned arrows. They number at present less than three thousand souls.

Hirado, isl., Japan, in the Strait of Korea, off the W. coast of Kiushiu. It is narrow and hilly (1,792 ft.), and 17 m. long. At one time it was a great emporium for trade. Hirado in modern times gives its name to a well-known variety of blue porcelain. See *Diary of Richard Cocks* (Hakluyt Soc. 1883).

Hiranyagarbha, in the *Rigveda*, a deity who is said to have arisen in the beginning, the lord of all, who upholds heaven and earth, and sustains all life. According to Manu, he was Brahma, the first male, formed in a golden egg. After a year Brahma burst the egg, one part of which became the heavens, and the other the earth; while between them were the sky, the eight regions, and the eternal abode of waters.

Hiring Agreements. An agreement to hire goods now frequently takes the form of a purchase on the hire-purchase system. Such an agreement is somewhat closely allied to a bill of sale, which is a mortgage of personal property; but it need not be registered. The hirer must take as much care of the hired goods as a prudent man does of his own; he is generally liable for damage, but not for fair wear and tear, and must deliver up the goods at the end of the term. The lessor is liable for negligence and for supplying unfit goods. A hiring agreement generally provides that the goods shall remain the property of the lessor till all instalments are paid. A hirer can sell the hired goods if he has actually bound himself by contract to purchase them. A hiring agreement need not be in writing.

Hirosaki, tn., N. Japan, 20 m. s.w. of Aomori. Excellent apples are grown. Near it is Fukaura, noted for its manganese mines. Lacquered ware is made. Pop. (1898) 34,771.

Hiroshima, tn., cap. of prov. Hiroshima, Japan, at the mouth of Otagawa R., 155 m. s.w. of Kobe; is a centre for lacquer, bronze, and other artistic work. Opposite Hiroshima is the rocky and richly-wooded island of Miyajima, or Itsukushima, one of the 'three chief sights' of Japan. It is a sacred island, dedicated to the goddess Bentin. Pop. (1898) 122,306.

Hirpne, division of the Samnite people. See SAMNIUM.

Hirsch, MAURICE, BARON DE (1831-96), Jewish philanthropist, born in Munich; devoted his vast fortune to schemes for the betterment of his race. To the *Alliance Israélite Universelle* he presented £80,000, and endowed it with £16,000 a year. For the benefit of persecuted Jews he founded in 1882 the (English) Jewish Colonization Association, with a capital of £2,000,000, and in 1892 he gave it an additional £7,000,000. The association has founded colonies of Russian Jews in Canada, S. America, and Asia Minor. In 1888 he gave £500,000 for the establishment of primary and technical schools in Austrian Galicia and Bukowina, and over £100,000 to the London hospitals.

•**Hirschberg**, tn., Prussian prov. of Silesia, at N. foot of Riesengebirge, 50 m. by rail s.s.w. of Liegnitz. Laces, linens, cottons, paper, artificial flowers, chemicals, etc., are manufactured. Hirschberg was formerly a centre of the Silesian linen industry. Pop. (1900) 17,865.

Hirson, tn., dep. Aisne, France, on Oise R., 32 m. N.E. of Laon; has foundries, and nail and glass works. Pop. (1901) 7,461.

Hirtius, AULUS, a friend of Julius Caesar, under whom he served as legate in Gaul in 58 B.C., and by whom he was made consul. The eighth book of Caesar's *Gallie War* is attributed to him or to Oppius, and also the *Alexandrine War*.

His Majesty's Theatre, London, was opened in 1705 as the King's Theatre, under the direction of Vanbrugh. In 1708 Nicolini made her appearance here; in February 1711 Handel's first opera, *Rinaldo*, was given. In 1734 came Farinelli. In 1789 the theatre was burned to the ground, but a new house was opened in March 1791. In 1806 Madame Catalini appeared, and Madame Vestris in 1816. Louis Lablache appeared here in 1830, Tamburini in 1832, Grisi in 1834, Persiani in 1838, and Mario in 1839. For many years ballet divided the honours with opera, and in 1845 the city went mad about the *pas-de-qualre*. Balfe was conductor in 1847, and the Jenny Lind fever seized London the same year. From 1853-67 the house was closed, except for short periods (1855-8, 1862-7) of opera under J. H. Mapleson. Burnt in 1867, it was rebuilt in 1869, but was only occupied by Mapleson from 1877 to 1883. In 1897 Mr. Beerbohm Tree constructed for himself Her Majesty's Theatre on the site of the old opera house, and has produced there *The Seats of the Mighty* (1897), *Julius Caesar* (1898), *The Three Musketeers* (1899), *A Midsummer-Night's Dream* (1900). Mr. Stephen Phillip's *Herod* (1900) was a great spectacular triumph. Recent notable productions have been *The Eternal City* (1902), *The Darling of the Gods* (1903), *Business is Business*, *Oliver Twist* (1905), and *The Newcomes* (1906).

Hispania. See SPAIN.

Hispaniola. See HAITI.

Hispar, pass (17,650 ft.) and glacier (40 m. long) of the Karakoram Himalayas, explored by Sir William Conway in 1892.

Hissar. (1.) Capital of a dist. of that name in Punjab, India, 100 m. by rail N.W. of Delhi, on the W. Jumna Canal. Founded in 1354 by the Emperor Firozshah, it fell into decay during the 18th century. Pop. (1901) 17,647. The district has an area of 3,540 sq. m., and a pop. (1901) of 781,717. It was nearly depopulated by famine in 1873. (2.) Khanate, Bokhara, Russian Turkestan, is exceedingly mountainous. The Hissar Mts. separate the basin of the Zerafshan from those of the Amu and Surkhhab. Its capital is Hissar, 125 m. S.E. of Samarkand, noted for its cutlery. Pop. 10,000.

Hissar, AFUUM KARA. See AFUUM KARA HISSAR.

Histology, the science which deals with the minute anatomy of organisms. Its development has, in the first instance, been dependent upon the compound microscope, and can hardly be said to have been definitely founded until the formulation by Schleiden and Schwann of the cell theory in 1838-9. Still earlier than this, however, Bichat (1801) showed that organisms are composed of different kinds of tissues, a generalization which lies at the base of all histological work. The histologist now recognizes four main kinds of tissues—epithelial, connective, muscular, nervous. These tissues may be purely cellular, as in the case of epithelial tissue; or they may contain a mixture of cells and fibres, as in nervous tissue. The differentiation of the constituent elements of a tissue is often a matter of great difficulty. No present-day worker, save in rare instances, thinks of examining a tissue until it has gone through a long process of preparation, the most important part of which is the staining with colouring matter, mostly aniline dyes.

Historical Manuscripts Commission, THE, is a royal commission originally appointed in 1869 to examine and report upon the collections of manuscripts preserved in different parts of the United Kingdom by corporations, colleges, and private individuals. The commission has published (to 1905) sixteen volumes of reports, and nearly a hundred volumes of 'appendices to the reports,' containing extracts from a very large number of manuscripts of general or historical interest. The master of the rolls for the time being is the chairman of the commission.

History originally denoted all acquired knowledge; next, a record of facts which had become known to the writer from his personal experience and observation; and finally, it was extended so as to include facts communicated to him by trustworthy and credible witnesses. As at present understood and applied, it has come to include, besides political events, the movements which belong to religion, law, literature, and economics.

The earliest records, whether sacred or profane, are lists or tables giving the succession and genealogies of ruling dynasties. Subsequently they begin to include dates of great military expeditions, treaties made with other nations, and payments of tribute. A further stage is reached when they are found incorporating annals of the court, or events relating to foreign policy. Associated, however, as such records mostly are, with a

despotic or an aristocratic form of government, they contain little that serves to illustrate the inner life of the people. The books of Kings and of Samuel in the Old Testament, written in the 7th century B.C., and the books of Chronicles, compiled some three centuries later, are the most notable examples of expansion from the meagre beginnings above described into something more nearly corresponding to what is now termed history. Similar records are the fragments of Egyptian history preserved by Manetho, which belong to the 3rd century B.C.; and such, again, are the primitive records of the Chinese and Japanese races.

Another stage is reached when the record assumes the form of a continuous narrative, spontaneously undertaken by the author. Of such literature ancient Greece affords at once the earliest and the most noteworthy examples. Commencing with Hecataeus (B.C. 550-476) of Ionia and his fellow-logographers, we find in the 5th century (about half-way between the appearance of the books of Kings and those of Chronicles) the two contemporary writers, Herodotus of Halicarnassus and Thucydides of Athens, compiling their respective histories. But while Herodotus justifies his claim to be called 'the father of history' by his singular genius for historic narrative, keen observation of social phenomena, and the fairness with which he holds the balance between Persian and Greek, his defective discrimination of the varied evidence from which his narrative is derived, his limited perception of the underlying causes of the events which he describes, and his too manifest desire not to allow even his own incredulity to interfere with his telling of his 'travellers' tales, compel us to assign him a place far below that claimed by general assent for his illustrious contemporary. In Thucydides, the absolute candour and impartiality of the writer in his presentment of the facts, his deep insight into the significance of events and into the laws which operate on human motives, together with the rigorous abstention from any direct expression of his own political views, combine to form a standard of historical excellence which has rarely since been attained and never surpassed. In reality, however, the speeches which he attributes to the envoys and other prominent actors in the war, being his own compositions, afford a vehicle for the opinions which he himself held, and may be looked upon as embodying the earliest known philosophical conceptions of contemporary events. The endeavour

of Xenophon, in the first two books of the *Hellenica*, to continue the narrative was an effort beyond his powers. As a writer, indeed, he reminds us more of Herodotus than of Thucydides; and his literary fame rests chiefly on his *Anabasis*, a classic example of simplicity and self-restraint in military narrative. On Polybius (B.C. 204-122), commanding a historic retrospect unattainable by the foregoing writers, it first devolved to shadow forth a philosophy of history. He appears to have discerned with remarkable sagacity the chief lessons to be derived from human experience, whether in Hellas or elsewhere, down to his time. Greek though he was, he could recognize in the subjugation of his race by Rome the result of general and inevitable laws. As Carthage had fallen, so the Macedonian empire had fallen, by the operation of those natural causes which compel the inferior race to give place to the superior. In the forces discernible as operating in the past, Polybius found an adequate explanation of the revolution in process in his own day.

The Latin literature, largely imitative of the Greek, offers no example of originality comparable with the foregoing; but Livy (B.C. 59-A.D. 17) and Tacitus (c. 54-117) are each exemplars of a high order of historical composition—the former distinguished by his singular command of the Latin language, faultless style, and animated portraiture of character; the latter by his pregnant sentences, unrivalled mastery of condensed expression, and by his singular insight into the main-springs of human action, and those social conditions in which character and conduct have their origin. Livy, like Thucydides, introduces long orations into his narrative; but he had no personal knowledge of practical affairs, and is wanting in breadth of view, occasionally betraying the influence of strong national partialities. Tacitus in his *Annals* too often deviates into what is biography rather than history; but in his *Histories* he takes a wider range, and, in the first book, his notices of the state of the empire after Nero's death mark a distinct advance towards a more enlarged conception of what was properly germane to his vast theme. Although, however, the sense of a common Roman citizenship undoubtedly discouraged manifestations of national rivalry and exclusiveness, there was probably no time in which historical licence was carried to greater lengths than in the days of Lucian (A.D. 120-200) of Samosata. It was the time, moreover,

when invention and legend, both pagan and Christian, were especially called into requisition in order to afford support to the opposing theories of the two contending parties with respect to the calamities which were then befalling the empire. From such superstition the best philosophy of the time stood contemptuously aloof; but Lucian, who has rarely been surpassed in subtle observation, whether of social characteristics or of political affairs, was induced to propound a new theory of the obligations incumbent on the historian, by writing his famous treatise, *How History ought to be written*. Lucian commences by insisting on the fact that history is *not* 'one of the things which it is easy to deal with,' but of all literary labour is the kind which demands the largest expenditure of careful thought, if indeed the outcome is to be, as Thucydides had expressed it, something valid 'for all time.' He proceeds, accordingly, to enunciate certain canons, the observance of which he considers indispensable if the function of the historian is to be adequately discharged. As regards the writer himself, he holds that he must be possessed of a natural power of discernment in political affairs, an adequate faculty of literary exposition, and a complete freedom from motives of self-interest, whether it be a dread of giving offence or a hope of reward. As regards the narrative itself, the language must be clear and plain, and all rhetorical ornament carefully eschewed, the sole aim being to state facts as they actually occurred. The writer must also be perfectly candid, panegyric and satire being equally shunned; neither the errors of distinguished leaders nor the gravest disasters attending his country's arms are to be palliated or concealed. 'To truth alone must he offer sacrifice, fearless, incorruptible, untrammelled, conceding nought either to hate or to friendship, a citizen of no city, recognizing allegiance to no ruler, and setting forth the results of his researches in a diction which the many may understand and the more educated approve.'

Writing at a time when the imperial power of Rome was at its culminating point, Lucian exulted in the empire's greatness; and his point of view is that of an enlightened and philosophic pagan, by which Christianity, as yet scarcely known by name, was very imperfectly apprehended. A century and a half later Christianity had become the religion of the state; and when, in 410, Rome fell before Alaric, there were those among

the pagan writers who presumed again to raise the cry which had been heard in the days of Marcus Aurelius, and to declare that the woes of the Roman world were a heaven-sent visitation, and could only be interpreted as a manifestation of the displeasure of the gods at the repudiation of their worship for that of the God of the Christians. It was in answer to such allegations that Augustine of Hippo, between the years 413 and 426, compiled his treatise, *De Civitate Dei*. He insists on the descent of all mankind from Adam, and on the results of the fall as manifest in the permanent division of humanity into two diametrically opposed elements—the two cities, as he terms them—the one, that of the Christian, swayed by the love alike of God and man, and destined eventually to become the city of the New Jerusalem; the other, the embodiment of the sin, the error, and the darkness which the Christian state has been called into existence to combat, vanquish, and ultimately exterminate. The influence exercised by Augustine's treatise on subsequent historical speculation can scarcely be overestimated, a result to which the abridgment drawn up by his devoted disciple Orosius largely conduces. In this compendium, the latter, by his teacher's express direction, gave especial prominence to the calamities and sufferings consequent upon war and hostile invasion, which, long prior to Christian times, had befallen the nations of antiquity, and had been marked by deeds of yet greater cruelty than Alaric's; and he is at special pains to point out that the leader of the Goths, overruled in purpose by the God of the Christians, had spared the treasures of the Vatican, while he challenges his opponents to show that the gods of paganism had ever been able to extend like protection to their own shrines.

The mental attitude of mediæval scholars and writers will, indeed, be but imperfectly understood if we fail to bear in mind that the abridgment by Orosius was the manual of profane history exclusively used by the teachers of the schools of Western Christendom throughout the middle ages. Estimated from this point of view, all pagan history came to be regarded as worthless. Even the history of Greece was well-nigh forgotten, along with the greater part of the Hellenic literature; while Roman history survived mainly through its association with the revived study of the Roman law. And thus, of general history, of ancient empires and Oriental

civilizations, little more was known than was to be gleaned or inferred through the distorting medium of the theory set forth by the bishop of Hippo. The influence exerted by Augustine in connection with historical teaching must therefore be regarded as reactionary. In every great conflict whereon vast national interests depended, the appeal to the God of battles, as the supreme arbiter of the fate of nations, was generally present to the minds of the majority of the combatants. Even Philip de Comines (1445-1509), a writer indisputably in advance of his time, and distinguished alike by his natural sagacity and knowledge of political affairs, does not hesitate to assert that the battle, rightly regarded, is an appeal to Heaven, and depends for its issue not so much on diplomatic foresight, competent generalship, and adequate, well-trained forces, as on the fiat of an overruling Power. The historical writers of each successive period, strongly convinced of the truth of this theory, and aiming, for the most part, at upholding the fame of their respective countries, necessarily became strong partisans. They not only accepted and maintained the general, the universal belief in a supreme Providence, with whom, when human agency has done its best, the final issue must abide, but they assumed that they themselves were endowed with the faculty which enabled them to recognize in each more momentous event the intervention of the supernatural. Instead, therefore, of making it their aim to illustrate in history the operation of natural, permanent, and immutable laws, it became their chief object to exhibit such laws as subject to continual interference and suspension.

As, however, the 15th century advanced, three great events combined gradually to bring about a marked advance in historic theorization: the revival of Greek learning brought back to Western Europe a fuller knowledge of the literature of antiquity; the invention of printing, by abbreviating the labour and facilitating the researches of the scholar, generated a rapid interchange of ideas which stimulated inquiry on every subject; the discovery of the New World compelled the philosopher to take account of elements in humanity not included in the survey of any mediæval thinker. The main stream of historical literature, indeed, continued much as before—servile in spirit, unscrupulous in statement, and, for the most part, uncritical in investigation, reflecting only the traditional conceptions, and even appearing

at a disadvantage when contrasted with such mediæval writers as William of Malmesbury, Otto of Freising, and Rahewin and Matthew of Paris. But, side by side, a more scientific spirit is to be found gradually asserting itself, and operating powerfully as a corrective.

In Germany, the career and writings of Pirkheimer (1470-1530) mark a notable innovation. His Latin *History of the Swiss War*, which gained for him the title of 'the German Xenophon,' is distinguished by its lucidity and impartiality, and is referred to by Ranke as a good example of the great superiority perceptible in such narratives when grounded upon personal experience and observation. Pirkheimer was a strong admirer of Lucian, and had laid his precepts to heart, a fact proved by his dedication of the latter's treatise on history to Maximilian, in the form of a Latin translation from his own pen. This volume may be said to have diffused among scholars generally a new conception of the obligations which historical composition, rightly understood, imposes on the writer. The influence of Maximilian himself is also to be noted as a potent factor in fostering the growth of a patriotic spirit among scholars and politicians throughout Germany.

The renaissance had rendered immense service to the cause of historic truth by the more critical spirit which it engendered, and by the consequent exposure of numerous mediæval forgeries, such as the *Donation* of Constantine, the pretended *Decretals* of Isidore, and the writings attributed to Dionysius the Areopagite. But the reformation in Germany, although originating in a like spirit, resulted in the appearance of two rival schools of theology, whose champions wielded the weapons of controversy with small regard to candour and to the lessons of the past. Amid the voluminous literature to which these controversies gave birth, the vast folios of the centuriators of Magdeburg (1559-74) may be cited as a representative collection. To set forth the vicissitudes of church history during the preceding thirteen centuries was, indeed, a task of no ordinary magnitude; but the partialities displayed by Matthias Flacius and his coadjutors caused their Catholic opponents to stigmatize their work as the 'Centuries of Satan.' Nor did it greatly mend matters that a new school manual of universal history was compiled, in which Melancthon assumed the part of Augustine, and his disciple, Carion, that of Orosius. For it

is in Carion (1538) that we find the four great empires of antiquity enumerated as the Assyrian, Persian, Greek, and Roman—a historical signment resting mainly for its support on the book of Daniel, which Melancthon, in common with his contemporaries, supposed to have been written six centuries B.C. The influence of the great reformer sufficed, however, to secure for the volume a wide reception, and a fundamental error in relation to ancient history was thus introduced into the schools of Protestantism, and continued to meet with unquestioning acceptance until overthrown by the unanswerable arguments of Christopher Keller (1638-1707).

But if the spirit of sectarianism gave rise to grave perversions of history, it at the same time imparted fresh stimulus to the study. In the same year that the centuriators of Magdeburg brought their labours to a conclusion, there was published at Basel a volume of short Latin treatises, eighteen in number, each dealing with the subject of history in general, or setting forth the method by which it could best be treated as a branch of learning. None of these treatises, however, can be regarded as of permanent value; but in the meantime the Frenchman Jean Bodin (1530-96), the author of the famous *Republic*, published in 1566 his *Method of easily attaining to the Knowledge of History*. That the first concern of the student of history is with mankind—with himself, that is to say, and the world around him—that a knowledge of cosmography and of the influences of climate is essential to a right apprehension of universal history, and that an insight into religious truths and the operation of divine laws will be materially aided by a comparative study of religions, were novel and startling theories in the second half of the 16th century. In his fourth chapter, Bodin discusses at considerable length, and in noteworthy agreement with Lucian, the question as to the qualities most to be desiderated in the historian; and he prefers to leave it open, as a moot question, whether it is within the province of the historical writer himself to pronounce judgments, to praise or to blame, or in any way to arbitrate on the merits of persons or actions. In his second chapter he boldly challenges the theory of the four empires, and does not scruple to contrast Melancthon's daring application of the figurative language of Daniel with the modesty of Calvin, who, when consulted as to the historic relevancy of the mystic imagery of

the Apocalypse, candidly confessed his inability to interpret it. Bodin's tenth chapter is interesting from the fact that it contains a list of the historical writers at that time in print, and grouped under the countries to which they specially relate.

De Thou or Thuanus (1553-1617), the eminent minister of Henry IV. of France, in his *History of his Own Time*, exhibits a judicial impartiality which seems to fall but little short of the ideal set forth by Bodin; while his preface attests even yet more clearly the influence of Lucian's treatise.

Clarendon's *History of the Rebellion* (final revision, 1667-74), although a work of signal merit, is essentially an apology in defence of the royalist party. Few writers, however, have better understood both what history should and should not be. Clarendon not only lays great stress on the paramount importance of access to original documents, but takes occasion to observe that even with such aids 'a man will not be enabled to write a history, if there be an absence of that genius and spirit which is contracted by the knowledge and course and method of business, and by conversation and familiarity with courts and the most active and eminent persons in the government.'

In France, the famous *Discours sur l'Histoire Universelle* (1681) of Bossuet exerted a reactionary influence. Bossuet adopted the patristic estimate of the Jewish nation and its records, and accepted, almost without qualification, the Augustinian doctrine of the world's history. He admitted, indeed, the existence of secondary causes, but by habitual reference to an overruling Power he evaded the labour and patient investigation requisite for the ascertainment of physical laws.

After an interval of more than half a century, appeared the epoch-making work of Montesquieu (1689-1755), the *Esprit des Loix*. In arriving at the fundamental principles of his philosophy, Montesquieu's researches and ponderings were long and arduous, for, as he himself tells us, 'they were drawn, not from my prejudices, but the nature of things.' Starting with an enlarged conception of laws, he defines them as 'the necessary relations resulting from the nature of things'—operative, constant, and immutable throughout creation, the chief determining causes of the course of history, compared with which legislation, great political crises, and powerful individualities can have but a secondary and altogether subordinate influence. To discover and interpret the operation of

these laws, alike in physical and social phenomena, must be the chief aim of those who seek to construct a science of history. In treating of physical laws, in the light of a broad induction from a vast array of facts, Montesquieu was largely aided by Bodin; in dealing with questions of legislation, customs, and institutions, he owed not a little to Machiavelli, and also to the Cartesians and to Locke; but every chapter bears the impress of a powerful and commanding originality.

In the year 1725 appeared the *Scienza Nuova* of Vico, the Italian philosopher, wherein he propounded afresh the Platonic theory of a Divine Idea, which he held permeated all history and guided human destiny. Under its influence, the operation of which he considered to be constant and uniform, history resolved itself into cycles or recurrent periods, and thus, in a manner, repeated itself, but always with a difference. From each great revolution humanity emerged strengthened, purified, and gifted with higher powers and actuated by nobler aims. In marked contrast to Augustine's two opposing cities, Vico conceived four vast republics, guided by Providence in an ever progressive course, and presenting in each successive cycle the best possible world that existing conditions would permit.

We have no evidence that Vico's speculations had become known to Turgot (1727-81) at the time (1750) when he delivered his two discourses at the Sorbonne; otherwise, the second discourse, entitled *The Successive Advances of the Human Mind*, might well appear a development of the earlier writer's main theory. To Turgot it seemed that progress was the essential, the distinguishing characteristic of man, and that history was rightly its record. Each epoch, he pointed out, is linked to those which precede or succeed it by a broad sequence of causes and effects; each generation bequeaths to the next an ever-increasing legacy of experience and knowledge, which, preserved by multiplied signs of speech and writing, becomes the inalienable possession of the entire race. He further shows that progress is, with civilized man, an indispensable condition, and those nations which, content with the attainment of a certain standard of scientific knowledge, have sought to intrench themselves within those limits, have invariably been outstripped by a more energetic race. To the importance attached by Montesquieu to the influence of climate, he gave but a qualified assent, and he adduces a series of facts to

show that the relation between climate and civilization is not constant, and that climate is, at any rate, not the sole factor in determining the characteristics of races (*Œuvres*, ii. 267). In his earlier discourse, *On the Advantages conferred by Christianity upon the Human Race*, Turgot, much as he differed from Bossuet, appeared as the advocate of the church, and consequently found himself in direct opposition to the new philosophical movement represented by Diderot (1713-84) and the Encyclopédistes, powerfully aided by the literary activity of Voltaire and Rousseau. Profoundly impressed by the degraded condition of the masses around them and the oppression which, they held, was the main cause of that degradation, this new school regarded with avowed hostility most of the existing institutions of their country, whether ecclesiastical or political. Misgovernment, antiquated theories, wrongly directed education were, they held, the sources of these evils, and must consequently be either abolished or reformed. But such views, although destined to exert an immense influence on the historical literature of a succeeding generation, were not derived from the study of the past. Voltaire's contempt for everything mediæval passed all reasonable bounds; while, on the other hand, he signally failed adequately to recognize the genius of Montesquieu. He is entitled, however, to high praise as a historian, and his *History of Charles XII. and Age of Louis XIV.*, founded as they are on original sources, and evincing a genuine regard for accuracy and veracity, are excellent examples of historic composition. Their chief defect is the absence of any endeavour to refer back events to general or remotely operative laws; while the causes, even of the most important, are assigned, now to some trivial incident, and now to the influence of some great personality.

In Germany, after the peace of Westphalia, the few scholars who devoted themselves to historical studies rarely did more than collect materials. Even the researches of Leibniz (1646-1716), in connection with his projected *History of the House of Brunswick*, appeared only in his *Scriptores Rerum Brunsvicensium* (1707-11); and his *Annales Imperii Occidentis*, extending from 768 to 1005, remained unpublished, until given to the world by Pertz in 1843-6. Among the many services rendered to learning by Leibniz, not least was the disillusionment which he effected among philologists with regard to the real place of Hebrew

among the Semitic languages. Prior to that time the belief that it was the parent tongue from whence all other languages were derived, had rendered the study of philology an inextricable maze of conjecture. A like genuine service was rendered by Christopher Keller to history when he prevailed upon scholars to renounce the theory of the 'four empires' for the division of the known historical eras into ancient, mediæval, and modern—the first terminating with the accession of Constantine I., the second with the capture (in 1453) of the city to which Constantine gave his name.

It is not until the latter part of the 18th century that any material improvement is to be discerned in Germany, when it appears as mainly due to French influences working mediately through Switzerland. Isaac Iselein (1728-82), Wegelin (1721-91), A. L. von Schölzer (1735-1809), and Johannes von Müller (1752-1809), all approached different fields of philosophical inquiry with views that were to some extent original. The *Universal History* of the last-named marks, indeed, a new departure in the treatment of so vast a subject, and takes rank as the first work of the kind which, while exhibiting the several histories of the different nations in close connection, discriminates with accuracy the characteristic features of each. In 1784 Immanuel Kant published his *Ideas towards a Universal History from a Cosmopolitical Point of View*, a treatise of which Schiller's inaugural discourse delivered in 1789 (as professor of history at Jena) was little more than an echo. Kant maintains that the human will is never really free, and that even the most masterful spirits are but the unconscious instruments of an irresistible, all-pervading force working through all history. Man simply gives effect to that which nature designs. Kant held, however, that a progressive improvement in civil polity was to be discerned in Europe, and that Europe was destined to give laws to the rest of mankind; while the final cause of all history was to guide civilized communities to the development of a perfect political constitution.

From the time of Kant the whole conception of history becomes in Germany more complex and profound. Schelling (1775-1854) and F. Schlegel (1772-1829) each propounded a new theory, while the teaching of Hegel (1770-1831) gave rise to the formation of an important school. Michelet, Quinet, Schwegler, Lassalle, Zeller, and Kuno Fischer all, in a greater or less degree, reflected the influence of that eminent

philosopher in their researches. F. C. Baur and Strauss applied his method in their investigations into sacred history.

Side by side with this remarkable speculative movement there was also rising up in Germany a school with widely different characteristics. In Niebuhr (1776-1831) and Savigny (1779-1861) scholarship of the highest type was to be seen in combination with great original power, a strongly national spirit, and an extensive knowledge of men and affairs. By precept and by example they alike enforced the theory that a trustworthy science of history is to be arrived at only by a series of inductions derived from accurate and exhaustive research in each particular field. By laborious study of long-disjointed fragments of evidence and a sagacious insight into the kernel of truth which lay shrouded in the 'myth,' Niebuhr, in his *History of the Roman People*, reconstructed the history of the Latin race; by similar, although less conjectural methods, Savigny compiled his *History of the Roman Law in the Middle Ages*, a work which may fairly be said to have initiated the historical study of law; while the labours of both these eminent scholars may be said to have been, in a manner, reflected in the researches of Waitz (1813-86), the founder of the school which established an organic conjunction between historical and legal studies. Scarcely less important were the services rendered by Stein (1757-1831), who, sharing in that revived spirit of Prussian nationality which followed upon the fall of Napoleon, first projected the invaluable series—the *Monumenta Germaniæ Historica*—associated with the name of Pertz (1795-1876). In 1824 Leopold von Ranke (1795-1886) published his *History of the Romance and German Races from 1494 to 1514*, with a masterly criticism of the sources to which he had been mainly indebted. Towards the conclusion he pointed out certain improvements in historical investigation which he deemed essential to a genuinely scientific method. In the preface to his *History of Germany in the Period of the Reformation* (1839-40) he reverted to this latter subject, at the same time expressing his conviction that, in no long time, the duly-trained historian would cease to rely on the statements of even contemporary writers, unless derived from a first-hand knowledge of the facts, and would, as far as possible, ground his narrative solely on original documents.

Under the depressing influences of the Hanoverian rule, history declined greatly in England. The

painstaking labours of Strype (1643-1737) pale beside the splendid research of Muratori (1672-1750). The reception accorded in France to Voltaire's famous *Essai sur les Mœurs et l'Esprit des Nations* (1755) stands in marked contrast to that vouchsafed to the two first volumes of Hume's *History of England*, published at the same time. Even the undeniable merits of Robertson's *History of Charles v.* (1769) bring into stronger relief the defective knowledge of earlier times betrayed in his introduction. Gibbon's *Decline and Fall of the Roman Empire* (1766-88), justly characterized as 'the greatest monument of historical research united to imaginative art of any age in any language,' was written, for the most part, in a foreign land, and derived, on the author's own showing, but little inspiration from his native country. But with the commencement of the 19th century the influence of German scholarship brought about a decisive change. Herbert Marsh (1757-1839), Lady Margaret professor of divinity at Cambridge, had studied under Michaelis at Leipzig, and did much to familiarize his countrymen with the results of an improved Biblical criticism. Niebuhr's *History of Rome* (1827-32), translated by Thirlwall and Julius Charles Hare, found, it was said, more readers in England than did the original in Germany; while the publication of *The Philological Museum*, commenced in 1831 under the editorship of the same two eminent scholars, initiated a corresponding advance in classical scholarship. In 1838-43 appeared *The Early History of Rome*, by Thomas Arnold (1795-1842), a work largely founded on Niebuhr's researches, which were further brought under the notice of English scholars by the writings of Arnold's intimate friend, Bunsen, who resided in England as Prussian ambassador to the English court during the years 1842 to 1854. On the other hand, Sir G. C. Lewis (1806-63), in his *Enquiry into the Credibility of the Early Roman History* (1855), challenged, with great acumen, some of Niebuhr's most important conclusions. Between 1835 and 1850 appeared the rival histories of Greece by Grote (1794-1871) and Thirlwall (1797-1875). Each author had commenced his researches unknown to the other, although they were personal friends.

The speculative tendencies of French philosophy found notable expression in the writings of Charles Comte (1782-1837), who, in his *Traité de Législation*, reopened the question of the influence of physical laws upon

civilization, a subject which he illustrated by a new array of facts and with great felicity of treatment. The better known Auguste Comte (1798-1857) compiled his *Cours de Philosophie Positive*, and founded a school which, in the course of another generation, was represented by an extensive literature. The movement extended to England, and Buckle (1821-62), in his *History of Civilization*, reviewed the chief theories of his predecessors, and propounded his own conclusions, with unprecedented wealth of illustration and remarkable ability. His views were, however, challenged by a large section both of the religious and the scientific press, and probably no work of equal merit was ever subjected to a like amount of unfair and disparaging criticism.

The activity of the more strictly historical school in France now began to command the attention of all learned Europe, and J. S. Mill (writing in 1844) affirms that their writings far surpassed those of Germany in importance. The works of Sismondi (1773-1842), Thierry (1795-1836), Mignet (1796-1884), Thiers (1797-1877), and Michelet (1798-1874) exhibit characteristic merits, but all, with the exception of Mignet, betray the influence of strong partialities very imperfectly disguised. The writings of Guizot (1787-1874) and De Barante (1782-1866) present, however, a more distinctly scientific spirit. Guizot, who edited Gibbon, and first drew attention to the invaluable labours of Savigny, defined anew the true aims of the historian: it was his view that faithful research, with its results duly assimilated, ought to enable the writer to supply such a portraiture of the past that it should be, both to him and to his reader, a veritable present. De Barante, on the other hand, in his *Histoire des Ducs de Bourgogne*, sought to carry out the theory which he unfolds in his preface—a theory closely resembling that of Lucian—whereby he postulated two primary canons: the necessity for the utmost vigilance in the acceptance of facts, and the most rigorous self-effacement on the part of the historian in their exposition. He preferred, accordingly, wherever it was possible, to leave his early chroniclers to tell the story in their own language. But their quaint and obsolete diction repelled the ordinary reader, and it was reserved for Thierry and Michelet, two young and enthusiastic scholars, combining a special faculty of graphic description with the results of conscientious study, to advance the art of historical narration a further stage. To

Michelet the world is also indebted for a translation of the works of Vico (1835), together with a criticism of his genius, which revived and for the first time did justice to the memory of that great philosopher.

During the last quarter of a century the path marked out by Ranke appears to have attracted the best historic talent, the facilities for its pursuit having also largely multiplied. Free access has been afforded to the national archives of all the chief countries of Europe, their contents have been carefully calendared, the more important manuscripts in both public and private libraries have been printed and published; while innumerable ancient inscriptions, a source which Ranke himself regarded with despair, have been brought to light and deciphered. Labours of scholars such as Pertz, Waitz, Mommsen, Curtius, Sickel, and Ficker in Germany, Stubbs, Freeman, and S. R. Gardiner in England, G. Monod, Lavis, and Luchaire in France, have borne fruit in works which, for the most part, are not likely soon to be superseded. Concurrently with this improved standard of performance, the conviction has steadily been gaining ground that, if history is to be regarded as a serious study, it must assume a yet more scientific form and character. No preconceived theory, no local or national sympathies, no political ties must be permitted to give it bias or colour. The primary and paramount consideration must be to ascertain accurately each fact, as far as the known evidence permits; the ultimate aim must be the scientific synthesis of the whole body of such facts. Of the conclusions to which they may appear to point, and of the consequences which such conclusions may entail, the historian, as such, has no cognizance. His aim is simply and solely the attainment of historic truth. Towards the achievement of this purpose no labour, no precaution must be spared, and method, in connection with research, assumes accordingly unprecedented importance. Hence the appearance, within the last few years, of treatises dealing especially with the technique of palaeography and the details of textual criticism, such as Bernheim's *Lehrbuch der historischen Methode* (1889; 4th ed. 1903) and Langlois and Seignobos's *Introduction aux Etudes Historiques* (2nd ed. 1899; Eng. trans. by G. C. Berry, 1898). On the importance of this technical knowledge, as enabling the possessor to discriminate between genuine and spurious documents, and to detect interpolations, it is un-

necessary to insist. Of its employment in conjunction with the canons of historical composition above indicated, a good example is afforded in the work of A. Anlard, *Histoire Politique de la Révolution Française* (1901), a production which may be said to illustrate the dictum that 'the historian is at his best when he himself does not appear'; and in the *Cambridge Modern History* (now in course of publication) the same principle, as inculcated by the late Lord Acton, is assumed to underlie the treatment adopted by the respective contributors.

See Johannes von Müller's *Vierund-zwanzig Bücher allgemeiner Geschichte besonders der europäischen Menschheit* (1810); L. Wachler's *Geschichte der historischen Forschung* (1812); Wilhelm von Humboldt's *Ueber die Aufgabe des Geschichtsschreibers* (1841); W. Hertzberg's 'Geschichte der Geschichte,' art. in *Ersch und Gruber's Encyclopädie* (1855); H. T. Buckle's *History of Civilization in England* (3 vols. new ed. 1867); Joh. G. Droysen's *Grundriss der Historik* (1868); Robert Flint's *The Philosophy of History in France and Germany*, vol. i. (1874), and *Historical Philosophy in France and French Belgium and Switzerland* (1893); Max Duncker's *Geschichte des Altertums* (9 vols., 5th ed. 1878-86—this edition differs materially from that on which the English trans. 1877 is founded); Dr. Ignaz Jastrow's 'Die Weltgeschichte in ihren neuesten Darstellungen,' art. in *Deutsche Rundschau* (February 1881); Eduard Meyer's *Geschichte des Altertums* (4 vols., 1884-1901), a work which in a great measure supersedes that of Duncker; E. A. Freeman's *The Unity of History* (1872), and *Methods of Historical Study* (1886); W. Stubbs's *Seventeen Lectures on the Study of Mediæval and Modern History* (1886); W. E. H. Lecky's *History of the Rise and Influence of the Spirit of Rationalism in Europe* (2 vols., new ed. 1882); Dr. F. Ratzel's *Anthropo-Geographie, oder Grundzüge der Anwendung der Erdkunde auf die Geschichte* (1882); Moritz Brosch's 'Zur Philosophie der Geschichte,' art. in *Unsere Zeit* for 1882; Henry C. Lea's *Studies in Church History* (1883); Dr. Franz X. von Wegele's *Geschichte der Deutschen Historiographie seit dem Auftreten des Humanismus* (1885); Lord Acton's 'German Schools of History,' art. in *English Historical Review*, vol. i. (1886), and *A Lecture on the Study of History* (1895); J. B. Crozier's *History of Intellectual Development on the Lines of Modern Evolution* (3 vols., 1897-1901); R. Rosemund's *Die Fortschritte der Diplomatie seit Ma-*

billon, vornchmlich in Deutschland - Oesterreich (1897); Otto Gierke's *Political Theories of the Middle Ages* (trans. by F. W. Maitland, 1900); *The World's History: a Survey of Man's Record*, edited by Dr. H. F. Helmolt, with an Introductory Essay by the Rt. Hon. James Bryce (8 vols., 1901); W. Z. Ripley's *The Races of Europe* (1900); J. B. Bury's *An Inaugural Lecture* (1903), and translation by same of Langlois's *Introduction to the Study of History*; C. H. Firth's *A Plea for the Historical Teaching of History* (1904).

Hit (anc. Is), tn., Asiatic Turkey, on r. bk. of Euphrates, 90 m. w.n.w. of Bagdad. Bitumen and naphtha extracted. Pop. 5,000.

Hitchcock, EDWARD (1793-1864), American geologist, born at Deerfield, Massachusetts. He became a Congregational minister, and afterwards, devoting himself to science, was elected professor of natural science, and president (1845-54), in Amherst College, holding the former office till his death. He officially served and reported (1830) for the state of Massachusetts; reporting also (1851) on the agricultural schools of Europe. His geology was always somewhat tinged by his theological studies. He was the author of *The Religion of Geology* (1851), *Technology of New England* (1858), *Geology of Massachusetts* (1841), *Report on the Geology of Vermont* (1861).

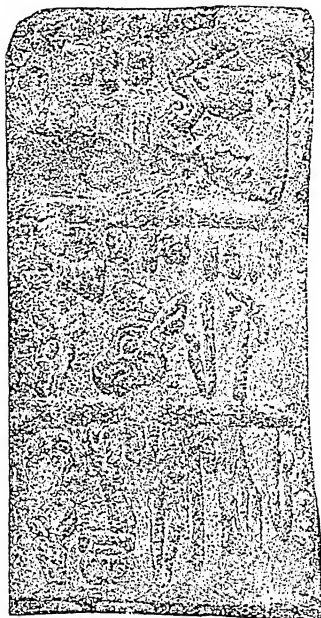
Hitchin, mrkt. tn., 17 m. n.w. of Hertford, England. Straw-plait is made. Lavender and peppermint are grown, and the oils are distilled. Girton College, Cambridge, was originally founded here. Pop. (1901) 10,072.

Hitopadesa, a collection of fables in Sanscrit literature, called a 'Friendly Instructor' (lit. 'salutary counsel'). The portion of the work which has circulated in India is chiefly composed of the fables of Bidpai or Pilpai. Another version, entitled *Kalila and Dimna*, is the source of much of the folklore which has spread through Europe. Some have ascribed the compilation of the *Hitopadesa* to the learned Brahman, Vishnuserman. It is a summary, in four books, of the *Panchatantra*, for popular reading and entertainment.

Hitteren, rugged isl. on w. coast of Norway, at entrance to Trondhjem Fjord. Area, with dependent small islands, 200 sq. m. Pop. (1900) 2,469.

Hittites. According to Gen. 10:15, Heth was a son of Canaan; and in the account of the purchase of the field of Machpelah by Abraham, the Hittites are accordingly described as living at Hebron (Gen. 23). Eze-

kiel also includes the Hittites among the founders of Jerusalem (16:3). Elsewhere in the Old Testament, however, the Hittites appear as a northern people: the betrayer of Bethel to the descendants of Joseph fled into the land of the Hittites (Judg. 1:26); Solomon imported horses from the kings of the Hittites and of Aram (1 Kings 10:29); and it was of the 'kings of the Hittites' that the panic-stricken besiegers of Samaria were afraid (2 Kings 7:6). Lucian's recension, moreover, gives the reading, 'the Hittites of Kadesh,' in 2 Sam. 24:6, for the unintelligible 'Tahtim-Hodshi' of the Hebrew text.



Part of a Hittite Inscription.

The monuments of Egypt and Assyria have thrown a good deal of light upon these Hittites of the north. Thothmes III. (1470 B.C.) received tribute from 'the Greater Land of the Hittites,' and when the Tell-el-Amarna letters were received by the Egyptian Foreign Office towards the close of the eighteenth dynasty (1400 B.C.), the Hittites were threatening the N. Syrian provinces of the Egyptian empire, and intriguing with the vassal princes and governors of Canaan. As the Egyptian power decayed, they made themselves masters of Syria, and established their southern capital at Kadesh, on the Orontes. Carchemish (now Jerablus), which commanded the ford across the Euphrates on the highroad

which led from Babylonia to the Mediterranean, was already in their hands, and Hittite chieftains were making raids on the extreme south of Palestine, and seizing for themselves the territories of the Pharaohs. This will explain the presence of a Hittite tribe in the neighbourhood of Hebron and Jerusalem, as well as the title of 'Greater' given by Thothmes III. to the Hittite land in the north.

The Hittites were of Cappadocian origin, and had descended upon the plains of Syria through the passes of the Taurus. Some of their chief remains are to be found at Boghaz-Keui and Eyuk, eastward of the Halys. Other monuments are scattered throughout Asia Minor, as far as Lydia and the Aegean, along the high-roads which radiated from Boghaz-Keui. This, as Professor Ramsay has remarked, would of itself indicate that the latter city was a centre of Hittite power.

The nineteenth Egyptian dynasty endeavoured to restore the Egyptian empire in Asia. But the way was blocked by the Hittites; and after twenty-one years of warfare, Ramses II. (1300 B.C.) was obliged to make a treaty of peace with 'the great king of the Hittites,' whose capital was now at Kadesh, on the Orontes. By this treaty it was stipulated that, while Hittite possession of Syria was formally acknowledged, Canaan should remain Egyptian. In their war with Egypt the Hittites had summoned to their aid vassals and allies from the more distant parts of Asia Minor—Lyicians, Mysians, and Dardanians. Hittite authority must therefore have been more or less obeyed throughout Asia Minor and Syria. But the empire presupposed by this fact did not last long. A confederation of independent kingdoms took the place of the central power, and the Aramaean Semites gradually recovered the cities and territories of which they had been dispossessed. When Tiglath-pileser I. of Assyria marched to the Mediterranean about 1100 B.C., he found a number of separate Hittite states, like those of Carchemish or Milid (the modern Malatiah), intermingled with others which were purely Semitic. The Khattina, or Hittites of the plain of Umk, on the banks of the Orontes, were among the last relics of the once-powerful Hittite race in Syria. The capture of Carchemish by the Assyrian king Sargon in 717 B.C. finally put an end to the Hittite domination in Syria, which had lasted for more than seven hundred years; from henceforward the Hittite race

survived only in its old home in Cappadocia or the Taurus. The Khate, or Hittites of the cuneiform inscriptions of Armenia, lived eastward of Malatiah.

The accuracy of the portraits of the Hittite people which we



Hittite Profiles.

owe to Egyptian artists is confirmed by their own sculptures. They were thick-set and the reverse of handsome, with protrusive nose and jaws, high cheekbones, and large nostrils. The face was beardless, the skin yellow, and the eyes and hair were dark. They wore a tunic over which a cloak was thrown, open on one side to facilitate walking; the head was protected by a cap or tiara, and the legs by high boots with upturned toes. The latter were really the snowshoes of a mountaineer, and significantly indicated the country from which the Hittite race had originally come; even in the hot plains of Syria they still continued to be worn, as we learn from the sculptures of



Hittite King.

the Ramesseum at Thebes. For arms the Hittites had a spear and a short sword which was carried in the belt.

Their art was derived from that of early Babylonia, but it was considerably modified in the borrowing, and was distinguished partly by a certain heaviness, if

not clumsiness, of form, partly by a love of composite animal figures. At Boghaz-Keui and Eyuk, for instance, we find a two-headed eagle, which, adopted in the later ages by the Seljuk sultans, passed, through the crusaders, into Europe; while the winged horse, the prototype of the Greek Pegasus, was also a Hittite symbol. Hittite art, in fact, was the starting-point of that art of Asia Minor which exercised so great an influence upon the art of early Greece.

Along with the art went a peculiar system of hieroglyphic writing. The characters are usually in relief, and the lines run in *boustrophedon* fashion. The discovery of cuneiform tablets at Boghaz-Keui, however, by M. Chantre, has shown us what the language was like, and also revealed the fact that it was identical with the language of the letter sent by Tarkundaraba, king of Arzawa, to the Pharaoh Amen-hotep III., which is among the Tell-el-Amarna tablets. Thanks to the use of ideographs, a few of the words and grammatical forms found in the letter can be made out. Thus, *kasma-ta* is 'for thee'; *bibbi* and *bibbi-d*, 'chariot' and 'chariots'; *lal-i* and *lal-ya*, 'I send'; *kha-luga talla*, 'a messenger'; *mi*, 'mine'; *ti* and *tu*, 'thine': *-s* is the suffix of the nominative case of the noun, and *-n* of the accusative. Of the Hittite religion we thus far know nothing, beyond the names of a few deities, such as Tarkus and Sanda(n). In 1903 Messrs. Mackay, Newberry, and Garstang, of the university of Liverpool, sought to establish an identity between the civilizations of the Hittites, Hyksos, and Etruscans. Such resemblances were pointed out some years earlier by De Cara, and were also called attention to by Major Conder. See Sayce's *The Hittites* (1888), Wright's *The Empire of the Hittites* (1884), and Jensen's *Hittiter und Armenier* (1898).

Hitzig, FERDINAND (1807-75), German Biblical scholar, born at Hauringen in Baden; was professor of theology at Zürich from 1833, and at Heidelberg from 1861. He belonged to the rationalistic school. Chief works: *Begriff der Kritik am Alten Testament* (1831); *Geschichte des Volkes Israel* (1869); *Zur Kritik Paulinischer Briefe* (1870); *Die Psalmen* (new ed. 1863-5); and commentaries on the Prophets, etc. See *Life*, in German, by Steiner (1882).

Hivites, one of the smaller aboriginal tribes dispossessed by the Israelites in their invasion of Canaan (Ex. 3:8, etc.). They possessed 'cities' like Gibeon and Shechem.

Hjelmar, lake, Sweden. N.E. of Lake Wetter, 79 ft. above the sea, with a superficial area of 198 sq. m. It is connected with Lake Mälär by the Eskilstuna R., the Arboga R., and a canal.

Hjörning, anc. tn., N. Jutland, Denmark, 28 m. N. of Aalborg; trades in dairy produce. It was the see of a bishop till 1554. Pop. (1901) 7,901.

Hkamti Long, a Shan state formerly tributary to Burma.

H.M.S., His Majesty's Service or Ship.

Hoadly, BENJAMIN (1676-1761), English religious controversialist and prelate, was born at Westerham, Kent. He took part in the various controversies of his day, condemning 'nonconformity' and 'occasional conformity.' In politics he led the Low Church party, which supported the revolution, and on the accession of the Hanoverians was appointed bishop, successively, of Bangor (1715), Hereford (1721), Salisbury (1723), and Winchester (1734). While holding his first bishopric, he carried on what is known as 'the Bangorian controversy' with the High Churchmen (e.g. Atterbury) as to the extent of ecclesiastical authority. He was an opponent of Sacheverell. In theology he was a latitudinarian, with an inclination to Socinianism. His *Works* were published by his son, with Life from *Biographia Britannica* (1773).

Hoang-ho. See **YELLOW RIVER**.

Hoare, SIR RICHARD COLT (1758-1838), English antiquary, born at Stourhead, Wiltshire; was for a time a clerk in the family banking-house in Fleet Street, London. After his wife's death he travelled much on the Continent, visiting Naples, Rome, Genoa, and parts of France, making antiquarian researches. His principal works are a *History of Wiltshire* (written 1812-20) and *Classical Tour through Italy and Sicily* (1819).



Hoar-frost.

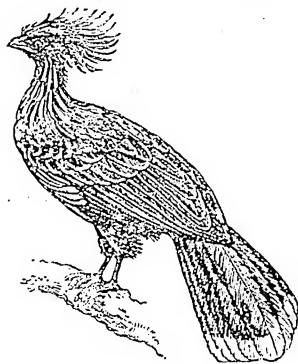
Hoar-frost. When the dew-point (see **DEW**) is below 32° F.,

hoar-frost is deposited as solid ice instead of dew. Hoar-frost is deposited most abundantly on such objects (grass, twigs, herbage) as are good radiators. It forms copiously on trees, which may bristle with ice spicules, while the ground in the vicinity may not show a trace of the deposit. As its formation is most marked in a calm atmosphere, hoar-frost occurs abundantly at the bottom of valleys and landlocked places; and if these are sheltered from the sun's rays, the ice may remain unmelted after it has disappeared from the surrounding plains. The spicules of hoar-frost are therefore not so regular as snow crystals, but present a more opaque appearance. See **FROST**.

Hoarseness, or unnatural roughness of the voice, is a leading symptom of diseases which affect the vocal cords. Any condition, such as laryngitis, which causes swelling and thickening of the cords, produces an alteration in the timbre of the voice. Thus, a common cold often causes a temporary vocal harshness, which disappears as the catarrh subsides. Should there be ulceration about the larynx, however, or should one of the cords be paralyzed, the hoarseness may persist for a considerable time. Ulceration may result from phthisis laryngea, from syphilis, and from malignant disease; while paralysis is often produced by the pressure of an aneurism or other tumour upon one of the recurrent laryngeal nerves. Probably the commonest cause of hoarseness in Britain is over-fatigue of the vocal mechanism. This condition is known as 'clergyman's sore throat.' Actors, barristers, and public speakers probably suffer as much as the clergy in this respect. In the treatment of hoarseness, rest of the vocal cords is imperative; the patient must not use his voice. In addition, counter-irritation may be applied to the skin over the larynx by means of mustard-plasters; and soothing inhalations of steam and hyoscyamus or similar drugs often give relief. When the condition depends on paresis, electricity is sometimes of service—one pole being applied to the weakened cord, while the other is in contact with the skin.

Hoar Stone, an unhewn monolith, generally unconnected with any circle of similar stones, and apparently used as a boundary-stone, though perhaps originally memorial. Such stones are called 'hare stanes' in Scotland, where also 'hare cairns' occur. See *Archæological Journal*, vol. xiv. p. 132.

Hoatzin (*Opisthocomus cristatus*), a curious South American bird, with various anomalous characters. It is pheasant-like, with a long, thin body, a strong, ser-



Hoatzin.

rated beak, an erectile crest on the head, and long claws. The breast-bone is curiously modified, the keel being much reduced, having its anterior portion aborted and its posterior flattened out. Over this flattened region is a thickened patch of skin, on which the bird rests. The crop is enormous, and the animal consumes large quantities of leaves and fruit. It lives among the dense undergrowth which fringes the margin of rivers and lagoons in the northern and western parts of S. America, and flies badly, with a heavy flapping motion. The young are remarkable in having claws both on the thumb and the index finger, and in using these, together with the bill and feet, in scrambling about among the branches. The wings have thus, to some extent, reverted to their original function of fore legs. The systematic position of the hoatzin is doubtful, but it is usually placed among the gamebirds (Galliformes), or sometimes in a separate order.

Hobart, cap. of Tasmania, Commonwealth of Australia, is picturesquely situated at the S. of the island, on the estuary of the river Derwent, and at the foot of Mount Wellington. The harbour is easy of access, well sheltered, and with great depth of water. Hobart is largely frequented during the summer season by visitors from New South Wales and Victoria, who are attracted thither by its agreeable climate, which resembles that of the S. of England. The finest public buildings are the Government House, the Parliament houses, and cathedrals. There are breweries, jam factories, flour-mills, iron foundries, tanneries, etc. Hobart is the see of an Angli-

can bishop and of a Roman Catholic archbishop. Pop. (1901) 31,317, or, including suburbs, 34,182.

Hobart Pasha, AUGUSTUS CHARLES HOBART - HAMPDEN (1822-86), English admiral, born in Leicestershire. As blockade-runner for the Confederate states (1863-5), his daring adventures are described in *Never Caught* (1867). Joining the Turkish navy (1867), he was made admiral and pasha (1869), and served against Greece and against Russia (1877). He also wrote *Sketches of My Life* (1887).

rode Castle. See E. Michel's *Hobbema et les Paysagistes de son Temps* (1890).

Hobbes, JOHN OLIVER, pen-name of Mrs. Pearl Mary Teresa Craigie, née RICHARDS (1867-1906), Anglo-American novelist, born at Boston, Massachusetts. Her novels, which belong to the analytical school of fiction, abound in epigram and descriptive passages. Among the best of them are *Some Emotions and a Moral* (1891); *The Gods, some Mortals, and Lord Wickenham* (1895); *The Herb Moon* (1896); *The School for Saints* (1897); *Robert*

of tutor in the Cavendish family, and in their service he remained to the end of his days. At first his predilection seems to have been for classical learning, and his first published book was a translation of Thucydides. In 1640 Hobbes went off to France, and for the next eleven years his headquarters were in Paris. As a philosopher Hobbes is generally regarded as the father of English materialism, and Locke was largely influenced by him. But Hobbes's psychology was rudimentary. In ethics he traced all moral distinctions to self-



Hobart, the Capital of Tasmania.

Hobbema, MEINDERT (1638-1709), Dutch painter, born in all likelihood in Amsterdam. Little is known of his life, save that he lived and died poor, his pictures not attracting attention till after his death. But he is now placed, with Cuyt and Ruysdael, at the head of the Dutch school of landscape painters, his strong points being perspective, chiaroscuro, and colouring. Several of his works are in the National Gallery, London—e.g. *The Avenue of Middelharnis*; *Showery Weather*; *Watermills and Bleacheries*; *Ruins of Bred-*

Orange (1900); *Love and the Soul-hunters* (1902); *The Vineyard* (1904). Her last novel, *The Dream and the Business* (1906), was ready for publication at the time of her death. She has also produced successful plays—e.g. *The Ambassador* (1898), *A Repentance* (1899), *The Wisdom of the Wise* (1900), and *The Flute of Pan* (1904).

Hobbes, THOMAS (1588-1679), English philosopher, born at Malmesbury, Wiltshire, and often referred to as the philosopher of Malmesbury. After leaving Oxford, Hobbes secured the position

interest, and he strongly advocated determinism. It is as a political philosopher that his fame is greatest. The object of his *Leviathan* is to determine the origin of sovereignty. This he finds in an original social compact, whereby man, weary of the insecurity of the state of nature, which is a state of war, agrees to submit to the authority of an individual or of individuals strong enough to repress anarchy. This compact, once made, is permanent, and cannot be annulled at the wish of the subjects; and it is the duty of

the sovereign to repress all rebellion as a crime against society. The sovereign maintains his position by force, not by consent. Nevertheless, the citizens are not losers, because any government is better than the primitive anarchy. A collected edition of his work in 16 vols. was published (1839-45), and there have been many editions of his *Leviathan*; Morley's Universal Library (1883) is one of the most recent. See *Life* by Croom Robertson (1886), and the volume in *English Men of Letters Series* by Leslie Stephen (1903).

Parliament (1820), advocated all reform measures, and became the champion of oppressed nationalities. He was also an intimate friend of Byron, and an active member of the London Greek Committee. In 1832 he was appointed Secretary for War, instituting many reforms at the War Office; in 1833, Secretary for Ireland; and in 1835, member of the (Indian) Board of Control, afterwards becoming president, till 1851. See *Memoir* by Hobhouse and Hammond (1905).

Hoboken. (1.) Residential suburb of Antwerp, Belgium, 3 m. s.w. of the city; has shipbuild-

for the purpose of blocking the exit of the Spanish fleet. He was taken prisoner with his crew of seven, but all were subsequently liberated by an exchange of prisoners. He retired from the navy in 1903.

Hobson, THOMAS (?1544-1631), the Cambridge carrier, immortalized by Milton in two humorous epitaphs. His insistence on each horse in his stable being taken out in turn gave rise to the expression 'Hobson's choice'—i.e. 'this or none.'

Hobson-Jobson, a phrase invented by British soldiers in India to describe the Moham-



A Picture by Hobbema: Village, with Watermill.

Hobby (*Falco subbuteo*), a migratory falcon, which occurs as a breeding species in parts of England, especially the south-east counties, and occasionally in Scotland. The wings are long, the tail comparatively short, and the plumage dark gray above, with a white patch on the cheeks, and mottled beneath. The male is twelve inches long, and the female fourteen.

Hobhouse, JOHN CAM, BARON BROUGHTON (1786-1869), English politician, was born at Redland, near Bristol. An ardent Radical, he represented Westminster in

ing yards on the Scheldt. Pop. (1900) 10,202. (2.) City, Hudson co., New Jersey, U.S.A., on the Hudson, just N. of Jersey City, with manufacture of silk. The Stevens Institute of Technology is situated here. The population is largely German. Pop. (1900) 59,364.

Hobson, RICHMOND PEARSON (1870), United States naval officer, was born at Greensboro, Alabama. A lieutenant on the flagship *New York*, he won fame in the American-Spanish war by sinking a hulk at the entrance to Santiago harbour, under the Spanish guns,

medan festival and procession of Mohurram. The words are intended to represent the cries of Mohammedans of the Shiah sect, who during the procession call out continually, 'Ya Hasan! Ya Hosain!' in whose honour the festival is kept. See HASSAN AND HUSSEIN.

Hoccleve, THOMAS. See OC-CLEVE.

Hoche, LAZARE (1768-97), French general, born at Montreuil, near Versailles; at twenty-five commanded the army of the Moselle, defeating the Austrians at Weissenburg, and compelling

them to evacuate Alsace (1793). Sent against the royalists in La Vendée, he quelled their insurrection; and in 1796 he was chosen to lead the abortive Irish expedition, the ships of which were scattered by storms. Placed, on his return, in command of the army of the Sambre and Meuse,

Hochelaga, vil., co. Hochelaga, Quebec, on St. Lawrence, 2 m. N.E. of Montreal, of which it is a suburb. Pop. (1901) 15,959.

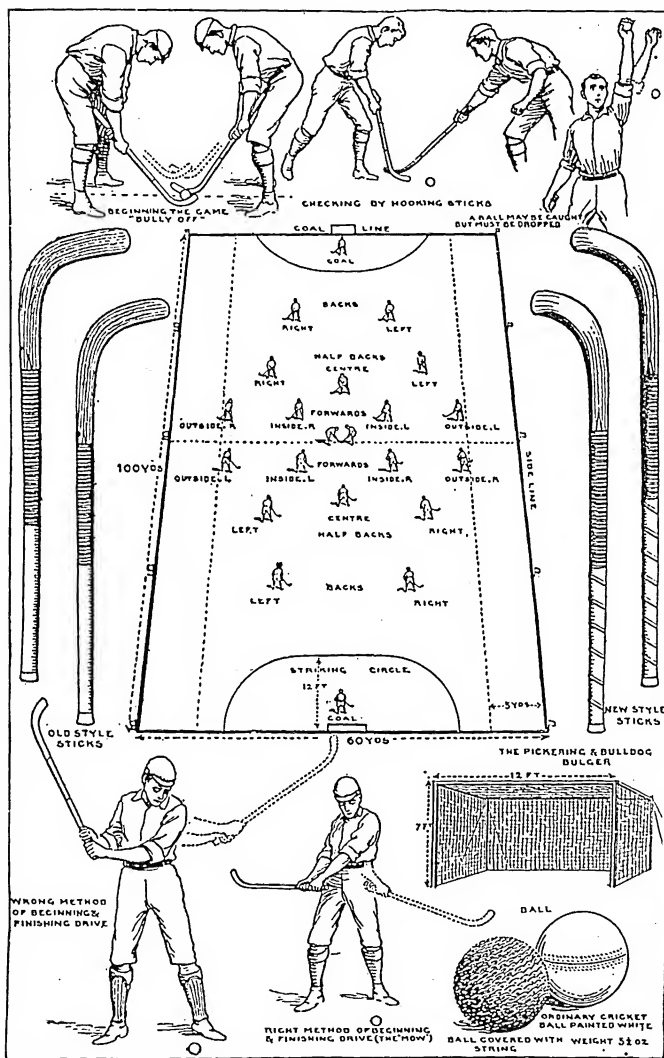
Hochheim, tn., Prussian prov. of Hesse-Nassau, 5 m. E. of Mainz; produces the well-known Hochheimer wine. Pop. (1900) 3,478.

Hochkirch, vil., kingdom of

Höchstädt, tn., Bavaria, on l. bk. of Danube, 34 m. by rail N.E. of Ulm; the scene of the defeat of Frederick of Staufen by Hermann of Luxemburg in 1081, of the Austrians by Marshal Villars in 1703, and of the Franco-Bavarian forces by Marlborough and Prince Eugene in 1704 (also known as the battle of Blenheim.) Pop. (1900) 2,225.

Hock, a class of light white Rhine wine. It possesses a distinct flavour, bouquet, and delicacy of its own; is full-bodied and elegant. The alcoholic strength is from nine to thirteen per cent. The more important brands of still hock are Hochheim, Erbach, Nierstein, Oppenheim, Oestrich, Liebfraumilch, Rudesheim, Steinberg, and Marco-brunn. Of the sparkling, Hochheim, Johannisberg, Rauenthal, Liebfraumilch, and Ehrenbreitstein. The majority of hocks are dry; some, however, are sweet, and even luscious. Vintages: Those of the years 1880, 1883, 1884, 1886, 1889, 1892, 1893, 1895, and 1897 are good; while the remainder for the last twenty years are either medium or bad. The natural dry white wines made from the Riesling or hock grape of California resemble the German hocks in such properties as appearance and flavour, but, as a rule, they possess more body and less acidity.

Hockey, a game played between two teams of eleven players, who hit a ball with sticks and try to put it through their opponents' goal. The game was in an unorganized condition till 1883, when the first modern rules were reduced to definite shape by the Wimbledon Club. The Hockey Association was organized in 1886, and was followed in rapid succession by many county associations. Scotland, Ireland, and Wales also have national hockey associations, and since 1894 international matches have been played yearly. The ground played on is 100 yards long and from 50 to 60 yards wide, with a goal 12 ft. broad and 7 ft. high at each end. Fifteen yards in front of each goal is marked a line 12 ft. long, curved round to the goal lines by quarter-circles, of which the goal posts are the centres; the space thus enclosed is called the 'striking circle.' The stick used weighs about twenty-three ounces, and is made of ash, with a curved blade, and a cane handle like that of a cricket bat. The ball is an ordinary cricket ball painted white. The game is decided by the number of goals scored. The ball must pass between the uprights and below the cross-bar and completely over the line to score a goal, and must have been hit or touched by the stick of one of the attacking side who is



The Game of Hockey.

he crossed the Rhine at Neuwied, and defeated the Austrians in several battles. The armistice between Archduke Charles and Bonaparte checked Hoche's advance. He died suddenly at Wetzlar. Hoche was one of the noblest figures of the revolutionary period. See *Life* by Cunéo d'Ornano (1892).

Saxony, 5 m. E. of Bautzen, the scene in 1758 of Frederick the Great's victory over the Austrians. In this action Field-marshal Keith fell.

Höchst, tn., Prussian prov. of Hesse-Nassau, on r. bk. of Main, 6 m. W. of Frankfurt; has aniline dye factories, tobacco factories, machinery, etc. Pop. (1900) 14,121.

within the striking circle; it may touch an opponent on the way. The teams change ends when half-time has been played (usually after forty-five minutes). The players on each side are organized into five forwards, three half-backs, two backs, and a goal-keeper. A player can dribble the ball, hit it, or pass it to another player, with his stick; he can catch it, but must drop it at once vertically to the ground; he can stop it with any part of his body.

—*Offences.* A player must not (1) raise his stick above his shoulder (this offence is called 'sticks'); (2) play with the back of his stick, fence or hook sticks with an opponent, unless one of them is within reach of the ball, or hook or strike an opponent's person with his stick; (3) charge, kick, collar, or trip an opponent; (4) obstruct an opponent by running between him and the ball, or touch him when running across him from the left unless he strikes the ball before he touches that opponent; (5) pick up, carry, kick, knock on, or back the ball except with his stick; (6) interfere with the game unless his stick is in his hand; or (7) touch the ball, remain within five yards of it, or in any way take part in the game, if he is 'off-side.'—*Off-side.* When a player hits the ball, any other player on his side who is nearer his opponents' goal at the moment when the ball is hit is 'off-side,' and remains so until the ball has been touched or hit by an opponent.—*Bully.* Two players stand with the ball between them, facing each other and the side lines. Each strikes the ground on his own side of the ball, and his opponent's stick above it, three times alternately; then either may strike the ball. The remainder of both teams must stand between the ball and their respective goal lines. Bullies are held (1) in the middle of the ground at the start of the game, after half-time, and after a goal; (2) twenty-five yards from the goal line and opposite the point where the ball has been hit across it by one of the attacking side; and (3) as a penalty at the spot where an offence occurs.—*Penalties for offences.* (1.) If committed by either side outside the striking circles, the penalty for offences 1 to 7 is a 'free hit' by an opponent of the offender. None of the latter's side are allowed within five yards of the ball, and the player who hits the free hit must not play the ball again until it has been played by another player (penalty, a free hit). (2.) If committed by the defending side inside their striking circle, the penalty is, (a) for offences 2 to 6, a 'penalty-bully,' held by the offender and any

opponent, the remainder of both teams standing outside the circle and taking no part in the game until the ball comes outside; (b) for offence 7 or any breach of the conditions governing a free hit, an ordinary bully; (c) for breaking the 'penalty-bully' rules, another penalty-bully. (3.) If committed by the attacking side within their opponents' striking circle, all offences are punished by a free hit to the defenders.—*Touch.* When the ball crosses a side line at a spot Z, having been last touched or hit by a player A, an opponent, B, stands behind the line at Z and rolls the ball along the ground in any direction except between a perpendicular drawn to the touch line at Z and A's goal. No one must approach within five yards of B, and he must not play the ball again until it has been played by another player.—*Corners.* When the ball crosses the goal line off one of the defenders, an opponent takes a corner hit from a point on the side or goal line within one yard of the corner of the ground nearest the point where the ball crossed over. All the defenders must stand behind their goal line, and all the attackers outside the circle. The latter cannot score a goal unless they first stop the ball dead, or hit it after it has touched the person or stick of a defender.

Hocking, JOSEPH (1855), was born at St. Stephen's, Cornwall; studied for the ministry of the Free Methodist Church, and has held several charges, the principal one having been Woodford Green, near London. He has also written several novels, including *Zillah* (1892), *Story of Andrew Fairfax* (1893), *All Men are Liars* (1895), *The Birthright* (1897), *The Scarlet Woman* (1899), *The Madness of David Baring* (1900), *Lest We Forget* (1901), *A Flame of Fire* (1903), *Follow the Gleam* (1903), *Roger Trevinton* (1905), *The Charlots of the Lord* (1905), and *The Man who Rose Again* (1906).

Hocking, SILAS KITTO (1850), English Methodist minister and novelist, brother of the above, was also born at St. Stephen's, Cornwall; held pastorates successively in Pontypool, Spalding, Liverpool, Manchester, and Southport. Resigning (1896) his position in the Methodist Church, he turned his attention to novel-writing, his recent works including *The Awakening of Anthony Weir* (1901), *Gripped* (1902), *Smoking Flax* (1904), and *Pioneers* (1905).

Hocktide, an old term for the Monday and Tuesday in the week following the second Sunday after Easter. It is a common legal term in mediæval documents, and is still in many places a time for local festivities.

Hodeida, fort. tn. and seapt., Yemen, Arabia, on the E. coast of Red Sea; exports coffee, skins, jowari (a kind of millet), sesame, and senna. Pop. (1901) 20,000.

Hodge, CHARLES (1797-1878), American Presbyterian theologian, born at Philadelphia; became professor of Oriental and Biblical literature at Princeton Theological Seminary (1822), of didactic and exegetical theology (1840), and of polemical theology (1852). He established the *Biblical Repertory and Princeton Review* (1825), which became the organ of old-school Presbyterianism, and which he edited until 1871. His chief works were *Systematic Theology* (1871-2) and a *Constitutional History of the Presbyterian Church in the United States* (1840-1). See *Life* by Hodge (1880).

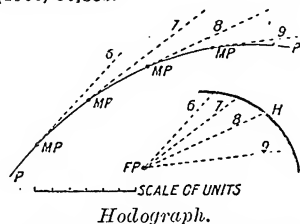
Hodgkin, THOMAS (1831), English historian, born at Tottenham; was engaged in banking from 1859 to 1902, but is best known as the author of historical works distinguished for wide knowledge and sound scholarship, such as *Italy and her Invaders* (8 vols. 1880-99); *Letters of Cassiodorus* (1886); *Dynasty of Theodosius* (1889); *Life of Theodoric* (1891); *Life of Charles the Great* (Foreign Statesmen Series, 1897); and *History of England from the Earliest Times to the Norman Conquest* (1906).

Hodgson, BRIAN HOUGHTON (1800-94), English Orientalist, was born at Prestbury, Cheshire; joined the East India Company's service in 1818; became assistant-resident at Nepal (1820-43). He wrote several monographs on ethnology, zoology, etc.; made collections of animals and plants; and presented some 1,800 sheets of drawings to the Zoological Society. His invaluable collections of Oriental manuscripts are now in the libraries of London, Paris, and Calcutta. See *Life* by Sir W. W. Hunter (1896).

Hodgson, SHADWORTH HOLLWAY (1832), English philosophical writer, was born at Boston, Lincolnshire. His chief works are *Time and Space* (1865), *Theory of Practice* (1870), *Philosophy of Reflection* (1878), and *The Metaphysic of Experience* (1898), in the last of which the results of his whole philosophical thinking are gathered up. According to this, the method of philosophy is that of an entirely unprejudiced analysis of experience—i.e. of what experience actually is, not of its genesis. He lays down the doctrine that consciousness as such cannot be regarded as an agent, but is wholly dependent for the 'conditioning' of its successive perceptions and states on the nervous system, of which it is the concomitant. Yet, though

material things alone in our experience exhibit agency or real conditioning, the material system is not self-explanatory, but rather points us to some more ultimate condition. This condition remains for speculation inaccessible and unknown, but may become the object of a practical or moral faith. In this and other points his views are akin to Kant's, though his philosophy as a whole is sharply opposed to that idealism which is usually regarded as the true development of Kantianism.

Hód-Mező-Vásárhely, tn., co. Csongrad, Hungary, 16 m. by rail N.E. of Szegedin; tobacco, fruit (melons), and wine. Pop. (1900) 60,883.



P, path of moving body; mp, body moving with successive velocities, 6, 7, 8, 9; fp, fixed point, imaginary, as origin for hodograph; u, hodograph.

Hodograph, in mathematics, the name given by Sir W. R. Hamilton to what is also known as the curve of velocities. When from any point as origin lines are drawn representing in direction and magnitude the successive velocities of a moving point, the curve traced out by the other extremities of the representative lines is called the hodograph. It leads geometrically to the elegant treatment of various cases of motion, the chief property of the hodograph being that the acceleration bears the same relation to it which the velocity bears to the path. For example, the tangent to the hodograph at any point is the direction of the acceleration. The hodograph of the parabolic path of a slowly moving projectile at the earth's surface is a straight vertical line, whose distance from the origin is the constant horizontal component of the velocity. The hodograph of planetary motion is a circle.

Hodson, WILLIAM STEPHEN RAIKES (1821-58), Anglo-Indian soldier, born at Maiesmore Court, Gloucester; fought through the first Sikh war. Appointed commander of the native Guides (1852), he was dismissed in 1855 for alleged errors in the regimental accounts. Subsequent inquiry exonerated him (1856), and at the outbreak of the mutiny he raised a body of cavalry known as 'Hodson's Irregular Horse,' and took charge of the intelligence department before

Delhi. He brought back the fugitive mogul to Delhi; but while arresting the shahzadas, or princes, deliberately shot them down to overawe the mob—an act condemned even by his admirers. After many daring exploits Hodson was himself shot in the zenana at Lucknow. A controversy has long raged over the charges brought against him of dishonesty and cruelty. He is ably defended by his brother, Rev. G. H. Hodson, in *Hodson of Hodson's Horse* (5th ed. 1889), and attacked in R. Bosworth Smith's *Life of Lord Lawrence* (5th ed. 1885), Kaye and Malletson's *Indian Mutiny* (1888-9), etc. See also T. R. E. Holmes's *Four Famous Soldiers* (1889), and L. J. Trotter's *A Leader of Light Horse* (1901).

Hoe, RICHARD MARCH (1812-86), was born in New York, U.S.A.; was the inventor of a printing machine of the modern rotary type, known as 'Hoe's lightning press,' which was afterwards rendered capable of printing simultaneously on both sides of a long sheet of paper. A cutting and folding arrangement completed the mechanism.

Hoek van Holland. See **HOOK OF HOLLAND**.

Hoeven, JAN VAN DER (1801-68), Dutch naturalist, was born at Rotterdam; became (1835) professor of zoology at Leyden, and earned European distinction by his *Handboek der Dierkunde* (3 vols. 1827-33), the second edition (1846-55) of which was translated into English as *Handbook of Zoology* (1856-8).

Hof, tn., Bavaria, on the Saale, 42 m. by rail N.E. of Bayreuth. It possesses a 16th-century town hall and an old Gothic church. There are manufactures of woollens, cottons, and linens, dyeing and stamping, chemicals, machinery, leather, hardware, and beer. Pop. (1900) 32,781.

Hofer, ANDREAS (1767-1810), Tyrolese patriot, was born at St. Leonhard in the Passeier valley, and was an innkeeper (Am Sand) and cattle-dealer, who, on the transference (1805) of the Tyrol from Austria to Bavaria by Napoleon, headed a revolt, and drove the Bavarians from the country. Again, in 1809, after twice defeating the Bavarians and French, and twice occupying Innsbruck, he defeated them at Berg Isel, near Innsbruck. Eventually he was betrayed to the French in January 1810, and carried to Mantua, where he was shot by order of Napoleon. See Stampfer's *Sandwirt A. Hofer* (1891).

Hoffmann, AUGUST HEINRICH, commonly called **HOFFMANN VON FALLERSLEBEN** (1798-1874), German poet and philologist, was born at Fallersleben in Brunswick; from 1830-42 was

professor of German at Breslau. His revolutionary *Unpolitische Lieder* (1840-1) cost him this post, and only after years of wandering did he return to Prussia (1848), and became librarian at Corvey (1860-74). His songs possess great simplicity, tenderness, and vigour; and he published very many collections of German children's songs, folk-songs, etc. Chief verse collections: *Alemannische Lieder* (1827); *Jägerlieder* (1828); and *Rheinleben* (1851); a selection of *Gedichte* (9th ed. 1887). Chief philological works: *Reineke Vos* (1834); *Deutsche Philologie* (1836); *Horre Belgicae* (12 vols. 1830-62). Autobiography: *Mein Leben* (1868-70); *Gesammelte Werke* (1890-3); *Ausgewählte Werke* (1905). See Wagner's *Hoffmann von Fallersleben* (1869).

Hoffmann, ERNST THEODOR WILHELM (1776-1822), German writer and musical composer, was born at Königsberg, and was trained to the law, but in 1806 had his career cut short, at Warsaw, by the invasion of the French. During the next ten years he earned a precarious living as theatrical musical director, musical composer, musical critic, caricaturist, scene painter, music teacher, and story-writer. In 1816 he was reinstated in office in the Supreme Court of Justice in Berlin, and there remained until his death. In consequence of his intense admiration for Mozart, he assumed the name of Amadeus in place of Wilhelm. Hoffmann united keen and strong common-sense with the most extravagant, lurid, and ungoverned fancy; and whilst he was fascinated by every abnormality and oddity in human character, and by morbid, grotesque, and horrible situations, he possessed the power of setting forth his imaginings with singular vividness and force. A thorough Bohemian, witty, wayward, sarcastic, and a wine-bibber, Hoffmann dazzled his contemporaries, but dissipated his own energies and squandered his talents. In music he is remembered for his opera *Undine* (1816), and the music to Werner's *Kreuz an der Ostsee*, as well as for a permanently valuable estimate of Mozart's *Don Juan*. His skill as a story-teller is exemplified in *Meister Martin*, *Das Majorat*, *Doge und Dogaresse*, *Das Fräulein von Scudéry*, and other pieces in the collections *Phantasiestücke in Callots Manier* (1814); *Nachstücke* (1817); and *Die Serapionsbrüder* (1819-25), the best of which were translated as *Weird Tales* (2 vols. 1885). The best edition of Hoffmann's works is that in 15 vols. by Ed. Grisebach (1899). See Carlyle's *Misc. Essays*, vol. i., and Ellinger's *Hoffmann, sein Leben und seine Werke* (1894).



'The Marriage Contract.' An Engraving after Hogarth.

Hofman, JOHANN CHRISTIAN CONRAD VON (1810-77), German theologian, born at Nürnberg in Bavaria; became professor of theology at Rostock (1842), and from 1845 at Erlangen. He was throughout an earnest advocate of orthodox Lutheranism. Chief works are *Weissagung und Erfüllung* (2 vols. 1841-4) and *Der Schriftbeweis* (2nd ed. 1857-60), a defence of Christianity from the evidence of its own records.

Hofmann, AUGUST WILHELM VON (1818-92), German chemist, was born at Giessen; trained under Liebig, and became professor at the Royal College of Chemistry, London (1845), where he resembled Arnold of Rugby in his power of inspiring others with his own spirit and enthusiasm. He returned to Germany, to become professor at Bonn (1864) and Berlin (1865). At Berlin Hofmann's researches were especially fruitful in the domain of organic chemistry. Those on coal-tar products led to the artificial preparation of numerous colouring matters from aniline, and practically revolutionized the art of dyeing. His writings include *Introduction to Modern Chemistry* (1865; several eds.), *A Handbook of Organic Analysis* (1853), and *The Life-work of Liebig* (1876).

Hofmann, JOSEF (1877), Polish pianist, a native of Cracow; was a pupil of Rubenstein, made his début when only six years old. A concert tour in the United States in 1887 was interrupted by the Society for the Prevention of Cruelty to Children. A careful musical training until 1894 placed him among the most promising of modern pianists.

Hofmeister, WILHELM FRIEDRICH BENEDICT (1824-77), German botanist, born at Leipzig; became professor of botany at Heidelberg (1863), and succeeded Von Mohl at Tübingen (1872). His chief work was *Die Entstehung des Embryos der Phanerogamen* (1849). Later Hofmeister became one of the principal German investigators in the science of morphology, applying the phylogenetic method long before Darwin's day, and a vigorous opponent of Schimper and Brann regarding their contention as to the spiral theory of leaf arrangement in plants. He also wrote *Vergleichende Untersuchungen höherer Kryptogamen und der Koniferen* (1851); *Die Lehre von der Pflanzenzelle* (1867); *Allgemeine Morphologie der Gewächse* (1868).

Hofmeyr, JAN HENDRICK (1845), South African journalist and politician, born at Cape Town. For many years he was leader of the Afrikaner Bond. A close ally of Cecil Rhodes till the Jameson Raid (1895), he repre-

sented the Cape Colony at the Ottawa Conference; and at the Salisbury-Knutsford Conference in London (1889) proposed an imperial customs federation. Negotiator of the Swaziland Convention with the Transvaal, 1890, he urged President Kruger, after the Bloemfontein Conference (1899), to offer better terms of franchise to the outlanders.

Hog. See **FIG.**

Hogan, JAMES FRANCIS (1855), journalist and author, born in Tipperary, was educated in Australia, whither his parents emigrated in his infancy. Entering the Victorian Educational Department, he remained with it eight years (1881); joined the staff of the *Melbourne Argus*, but resigned (1887) to come to London as a writer, chiefly on colonial subjects. Anti-Parnellite M.P. for his native county (1893-1900), he did good work as secretary of the colonial party, and as advocate of imperial federation. His works include *History of the Irish in Australia* (1887); *The Australian in London* (1888); *Robert Lowe* (1893); *The Sister Dominions* (1895); *The Gladstone Colony* (1898).

Hogarth, DAVID GEORGE (1862), English archaeologist, born at Barton-on-Humber, Lincolnshire. He has been a busy explorer in Asia Minor, and his excavations at Paphos, Dér-el-Bahari, Alexandria, Fayum, and elsewhere have yielded valuable results. He was director of the British school at Athens from 1897 to 1900. Among his works are *Devia Cypria* (1890), *A Wandering Scholar in the Levant* (1896), *The Nearer East* (1902), and *The Penetration of Arabia* (1904).

Hogarth, WILLIAM (1697-1764), founder of the British school of painting, born in London; set up business for himself (1718), and turned his attention to engraving on copper. From the outset he relied on his own powers of observation, and sought his models when roaming about the streets. Sincerity is a prominent note in all he did, despite the fact that he lived at a time when the trend of art was toward shallowness and insincerity, and when no encouragement was given to native art. His work was thus the pioneer effort of a new epoch. Sarcastic yet sympathetic, keenly observant, humorous, with a touch of pity in his wit, he possessed an extraordinarily retentive memory. He studied also under the sergeant-painter to the king, Sir James Thornhill, whose daughter he married clandestinely (1729), when he settled in S. Lambeth, and painted small 'conversation pieces.' He first became known as an engraver by his

plates for Butler's *Hudibras* (1726); as a painter, by his series *A Harlot's Progress* (1731). Thereafter followed *A Rake's Progress*, and his decorative painting on the staircase of St. Bartholomew's Hospital (1736). In 1745 he had a sale by auction of his pictures, and etched as ticket of admission his *Battles of the Pictures*; while to the same year belongs his culminating work, the six extraordinarily inventive pictures entitled *Marriage à la Mode*, now in the National Gallery, London. In his *Memoranda* Hogarth gives the reasons which led him to 'turn his thoughts to painting and engraving subjects of a modern kind and moral nature.'

He obtained large prices for his portraits—e.g. of *Garriek*. In 1745 he painted his famous portrait of himself (National Gallery), with the serpentine line on a palette in a corner, and the words, 'The line of beauty and grace.' Whereupon so eager a discussion arose that he wrote *The Analysis of Beauty* (1753), to explain, and to endeavour to fix a standard of beauty.

He succeeded his brother-in-law as sergeant-painter to the king (1757), and was reappointed on the accession of George III. In 1733 he had moved to a house in Leicester Fields (now Square), where he lived till his death. He was buried at Chiswick. Among his principal pictures are ten in the National Gallery, including also *Calais Gate*; in the Sloane Museum, *A Rake's Progress* and the *Election* series; and others in the National Portrait Gallery, the Foundling Hospital, and Lambeth Palace. Among his principal engravings are *The Emblematical Print on the South Sea* (1721); *Masquerades and Operas, Burlington Gate* (1724); tincture plates for Butler's *Hudibras* (1726); *Taste*, or *The Man of Taste*, or *Burlington Gate* (1731); *A Harlot's Progress* (1734); *A Rake's Progress* (1735); *The Company of Undertakers* (1736); *Strolling Actresses Dressing in a Barn* (1738); *The Enraged Musician* (1741); *Industry and Idleness* and *The Stage-coach* (1747); *France and England*, or *the Invasion* (1756); *The Cockpit* (1759); *The Bathos* (1764), etc. See *William Hogarth*, by Austin Dobson (1879); *William Hogarth*, by G. A. Sala (1866); *Hogarth Illustrated*, by Samuel Ireland (3 vols. 1891-8); and G. Baldwin Brown's *W. Hogarth* (1905).

Hogg, JAMES (1770-1835), 'the Ettrick Shepherd,' Scottish poet, song-writer, and essayist, was born at Ettrickhall, in the valley of the Ettrick, Selkirkshire. From about the age of six he worked for his living as a herd.

About 1796 he began to write poetry in imitation of Allan Ramsay, and afterwards for the first time came across the poems of Robert Burns. He strove to imitate the measure of the great Scots song-writer, and the effort made him a poet. In 1800 one of his songs, *Donald McDonald*, an ode of defiance upon the long-rumoured invasion of Britain by Napoleon, was published; and in the following year, during a visit to Edinburgh, he printed his *Pastorals, Poems, Songs, etc.* In 1802 he made the acquaintance of Sir W. Scott, then on the search for materials for his *Minstrelsy of the Scottish Border*, and assisted him in the preparation of the third volume. He published the *Mountain Bard* (1807); but in 1813 the publication of *The Queen's Wake* showed that he possessed genius of a higher order. He wrote for *Blackwood*, was one of the interlocutors in Christopher North's *Noctes Ambrosianae*, and did a good deal of hack work for booksellers. He died at Altrive, and was buried at Ettrick.

James Hogg is now regarded as the legitimate heir of Burns. *The Witch of Fife, The Skylark, When the Kye come Hame*, and, above all, *Kilmenny*, are aflame with the truest fire of genius. His best prose work, *The Brownie of Bodsbeck* (1818), a Covenanting tale, paints the life of the humble poor in a manner not surpassed even by Scott. *The Bridal of Polmoor, The Shepherd's Calendar, The Three Perils of Man, and The Three Perils of Woman* reveal a rich vein of Border romance and sentiment. Among Hogg's other works the following should be mentioned: *The Pilgrims of the Sun* (1815); *Madoc of the Moor* (1816); *Jacobite Relics of Scotland* (1819-21); *Winter Evening Tales* (1820); *The Private Memoirs and Confessions of a Justified Sinner* (1824), erroneously ascribed by some to Lockhart; *Queen Hynde* (1826); *Lay Sermons* (1834); *The Domestic Manners and Public Life of Sir Walter Scott* (1834), a work which gave great offence to Lockhart. See *Memorials* by Mrs. Garden, his daughter (1887; new ed. 1904); also her Introduction to *Poems* (Canterbury Poets); *Hogg*, by Sir George Douglas (Famous Scots Series, 1889); Thomson's *Collected Edition* of his works, in 2 vols. (1865); the *Ettrick Shepherd* memorial volume (1898); Wallace's *Poems of James Hogg* (1903); also the Selkirkshire edition of *The Brownie* (1903).

Hogg, Quintin (1845-1903), English philanthropist, was born in London. He was the founder and president of the London Polytechnic Institute, which grew out

of the Youths' Christian Institute in Endell Street, also founded by him. Its object was to provide evening teaching, technical training, gymnastics, music, and rational amusement to the young men and women of the commercial class in Central London—a scheme which has achieved an immense success. He wrote *The Story of Peter* (1900), a series of addresses; and *Day-Dawn of the Past*. See *Biography*, by E. M. Hogg (1904).

Hogget, diminutive of 'hog,' is applied to (1) a two-year-old sheep, (2) a young bear in its second year, and (3) a colt of a year old.

Hogland, a rocky island, famous for its quarries of granite, diorite, and porphyry (from which much of St. Petersburg has been built), in the Gulf of Finland, 70 m. s.w. of Viborg.

Hogmanay, a name given in Scotland (and in some parts of the north of England) to the last day of the year, when it is the custom for persons to go from door to door asking in rhymes for cakes or money.

Hog-plum (*Spondias*), a genus of tropical trees of the order Anacardiaceae. In Britain they are grown at stove temperature, in a light, fibrous loam. They bear fleshy, edible, plumlike fruits. The rich yellow fruit of the 'sweet Otaheite apple' (*S. dulcis*) is like pineapple in flavour; and the 'golden apple' of *S. lutea* is even more delicate.

Hog-rat. See HUTIA.

Hogshead. (1.) A statutory measure (*hhd.*), fixed A.D. 1423, containing 63 old wine gallons, or 52½ imperial gallons. (2.) A cask, of capacity varying with the commodity and locality—e.g. a hogshead of molasses or of cider, 100 gallons; of ale, in London 48 gallons, elsewhere 51 gallons. The measure is now principally used for cider.

Hogue, British first-class cruiser of 12,000 tons and 21 knots, launched at Barrow in 1900.

Hogue, or HOUGUE, small harbour, dep. Manche, France, on the E. of the Continent peninsula, 15 m. E. of Cherbourg. Here, in 1692, the English, under Admiral Russell, defeated the combined French and Dutch fleets, under Tourville. Pop. (1901) 2,832.

Hohenelbe, tn., Bohemia, Austria, near source of the Elbe, 14 m. W.N.W. of Trautenau; has manufactures of cotton, linen, pottery, and machinery, also iron foundries, paper mills, breweries, and marble quarries. Pop. (1900) 6,597.

Hohen Ems, vil., Vorarlberg, Austria, near the Rhine, 10 m. S.S.W. of Bregenz; has manufactures of cotton and ribbons. Pop. (1900) 5,662.

Hohenheim, vil., Württemberg, Germany, 5 m. S. of Stuttgart; is the seat of one of the best-equipped agricultural colleges in the world. It was founded in 1818, and now ranks with the polytechnics of the empire.

Hohenlimburg, tn., Prussian prov. of Westphalia, 30 m. by rail S. of Dortmund; manufactures iron and steel goods. Pop. (1900) 8,111.

Hohenlinden, vil., Upper Bavaria, 20 m. E. of Munich; was the scene of the victory of the French, under Moreau, over the Austrians, under Archduke John, on Dec. 3, 1800. The poet Campbell has commemorated the battle in his lyric *Hohenlinden*.

Hohenlohe, a principality in Franconia, Germany, but since 1806 included in Württemberg and Bavaria.

Hohenlohe-Schillingsfürst, CHLODWIG KARL VIKTOR, PRINCE OF (1819-1901), German statesman, born at Schillingsfürst in Bavaria; was early known for his Prussian sympathies. After Sadowa he was appointed (1866) chief minister of Bavaria, and tried to bring about the union of Southern and Northern Germany, but was forced by the clerical party to resign (1870). He advocated the alliance of Bavaria with Prussia in the Franco-German war. In 1874 he was sent as German ambassador to Paris, where he remained till 1885. As governor of Alsace-Lorraine (1885-94) he pursued a conciliatory policy. In 1894 he became imperial chancellor, but resigned in 1900.

Hohenmauth, tn., Bohemia, Austria, 11 m. by rail N.W. of Leitomischl. Pop. (1900) 9,473.

Hohenschwangau, royal palace of Bavaria, Germany, built in 1832, on the site of an ancient stronghold of the Hohenstaufens. It is adorned with numerous paintings by the Munich school, and stands in the Bavarian highlands, close to Füssen, 73 m. by rail S. of Augsburg.

Hohenstaufen, ruined castle in Württemberg, the ancestral cradle of the imperial family of the same name; stands (2,240 ft.) N.E. of Göppingen, half-way between Stuttgart and Ulm. The castle was built in 1080, and destroyed in the peasants' rising of 1525.

Hohenstaufen, name of a German imperial dynasty from 1138 to 1254. The first known member is Frederick of Bieren in Swabia. His son Frederick was made Duke of Swabia for his fidelity to the Emperor Henry IV. His grandson was crowned king of Italy (1128), and on the death of Lothair was elected emperor as Conrad III., handing on the empire to his nephew, Frederick

Barbarossa. The next emperors of this family were Henry VI., Philip, and Frederick II., whose son, Conrad IV., was the last emperor of the house of Hohenstaufen, which practically became extinct with Conrad, who was put to death by Charles of Anjou in 1268. The history of the family is one long contest with the Guelfs and the papacy, ending in the triumph of the latter. See *V. von Raumer's Geschichte der Hohenstaufen* (5th ed. 1878), and Schirmacher's *Die letzten Hohenstaufen* (1871).

Hohenstein-Ernstthal, tn., kingdom of Saxony, 11 m. by rail w. of Chemnitz; the seat of cotton and hosiery factories. Pop. (1900) 13,397.

Hohenzollern, German imperial dynasty, takes its name from the castle of Hohenzollern in Swabia, and traces its origin to Tassillon, who lived under Charlemagne. A younger son of the house, Conrad, sought service under Frederick Barbarossa, becoming burgrave or imperial steward of Nuremberg about 1170. In 1226 the family split into the Franconian and Swabian branches. In 1248 the burgrave of Nuremberg was Frederick III., head of the Franconian line, who contributed to the election of Rudolf of Hapsburg as emperor. In 1346 Burgrave John II. became governor of Brandenburg, of which later on Burgrave Frederick VI. was first elector (1415). In 1701, Frederick III., elector of Brandenburg, became first king of Prussia. In 1871 the king of Prussia became German emperor. The collateral Swabian line, founded by Frederick, count of Zollern, was (1576) divided into the Hohenzollern-Hechingen and the Hohenzollern-Sigmaringen lines. Owing to the troubles of 1848, Prussia was able to absorb these independent principalities. The proposal to raise Prince Leopold of Hohenzollern-Sigmaringen to the throne of Spain was the immediate cause of the Franco-German war. See Carlyle's *Frederick the Great*, Stillfried's *Stammtafel des Gesamthauses Hohenzollern* (1879).

Hohenzollern, two small principalities, Hohenzollern-Hechingen and Hohenzollern-Sigmaringen, in the s. of Germany, between the Neckar and the Lake of Constance. Area, 441 sq. m.; pop. (1900) 66,780, mostly Protestants. The region is hilly, the climate not very genial, and the soil not very fertile. The two principalities form together the Prussian administrative district of Sigmaringen, which elects one member to the Imperial Diet. Chief town, Sigmaringen. The castle of Hohenzollern stands on a steep eminence near Hechingen. (See preceding article.)

Hohkönigsburg, ruined castle of Alsace, on a spur of the Vosges, 6 m. w. of Schlestadt, presented by this town to the Emperor William II. in 1899, and restored in 1902. It was destroyed by the Swedes in 1633.

Höhscheid, a commune in Prussian prov. of Rhineland, 8 m. s.w. of Barmen; consists of over a hundred small hamlets, which carry on the manufacture of hardware and cutlery, also lead-mining. Pop. (1900) 14,172.

Hoi-hau, port, 3½ m. N.W. from Kiung-chau-fu, the principal town in Hainan Island, China.

Höijer, BENJAMIN CARL HENRIK (1767-1812), Swedish philosopher. A pupil of Kant and Fichte, he lectured from 1798 at Upsala University, developing, but along independent lines, the teaching of the former, chiefly in *Afhandling om den filosofiska Constructionen* (1799). In 1809 he was appointed professor of philosophy at Upsala. See *Samlade Skrifter* (5 vols. 1825-7).

Hokitika, cap. of Westland co., New Zealand, on riv. Hokitika, 153 m. w. of Christchurch, connected with Greymouth by rail (22 m.). In 1865 the great gold rush took place; in 1866 the output of gold was £1,400,000, and the permanent population 10,000. Pop. (1901) 1,946, and annual output of gold less than £200,000.

Hokkaido, term used by the Japanese to designate the N. part of the empire—i.e. the island of Yezo, the southern half of Sakhalin, and the Kuriles.

Holacanthus, a genus of bony fishes, related to *Chaetodon*, the members of which are distributed throughout the warmer parts of the Atlantic, Indian, and Pacific Oceans. The species are remarkable for their beauty of coloration. The commonest (*H. imperator*) is called 'Emperor of Japan' by the Dutch, and reaches a length of about fifteen inches; it is greatly esteemed as food. The body is blue in colour, with about thirty longitudinal yellow bands, and black and yellow markings in the head region.

Holbach, PAUL HENRI THYRY, BARON D' (1723-89), French philosopher and encyclopédiste, was born at Heidesheim in the Palatinate, but spent most of his life in Paris, where his great wealth enabled him to keep open house for the most celebrated writers of his day. He contributed extensively to the *Encyclopédie*, mainly on scientific subjects. In philosophy he followed Diderot, and in his *Système de la Nature* (1770; new Eng. trans. 1884) pushed his anti-religious principles to such extremes that he even shocked Frederick the Great and Voltaire, though the violence of his views was mitigated

by the sincerity of the author, and his passion for religious and political liberty. He was the model of Von Wolmar in Rousseau's *Nouvelle Héloïse*. Most of his works were printed anonymously or under a fictitious name at Amsterdam. See Avezac-Lavigne's *Diderot et la Société du Baron d'Holbach* (1875).

Holbeach, tn., 8 m. E. of Spalding, Lincolnshire, England; now 6 m. inland, though once on the shore of the Wash. William Stukeley, the antiquary, was a native of the town. Pop. (1901) 4,755.

Holbein, HANS, two German painters, father and son. (1.) HANS HOLBEIN THE ELDER (c. 1460-1524) was born at Augsburg, and formed his style upon the school of Roger van der Weyden, modified by a study of Italian tradition. An earnest, patient painter, his work was devoted chiefly to religious subjects, and is to be seen in Augsburg, Frankfurt, Basel, and Munich. At Hampton Court there is one portrait of a *Merchant and his Wife*. (2.) HANS HOLBEIN THE YOUNGER (1497-1543), the greatest of all German mediæval painters, was born in Augsburg. In his youth he assisted his father, and in 1515 went with his elder brother Ambrosius (b. 1494), also a painter, to Basel, where he joined the painters' guild (1519). There, and at Lucerne, he was employed in portraiture, and in extensive wall decoration, such as his *Peasants' Dance*, his frescoes for the town hall, and his celebrated *Dance of Death*, so original in conception and individual in execution (known widely through the engravings of Lützelburger), in which he represents with biting satire each grade of humanity, from pope to beggar, terrorized by Death. The boldness of his design, the fertility of his imagination, his close observation and realistic method, might have made him Germany's greatest historical painter. But he went to London (1526), furnished by Erasmus with an introduction to Sir Thomas More; and there he found ample employment as a portrait painter, and as such reached his mature reputation. A number of his finest religious pictures were painted prior to this first visit to England (also the fine portrait of Erasmus at Longford Castle), such as the eight scenes from *The Passion*, and *The Last Supper* (both in the Basel Museum), which show unmistakable influence of Leonardo da Vinci; *The Virgin and Child with St. Martin and St. Ursus*, dated 1522, and discovered by Mr. Zetter of Soleure in 1865; the beautiful doors of the minster at Basel; and the celebrated Meyer *Madonna* at Darmstadt, of which

there is a fine replica in Dresden. At Windsor there is a collection of eighty-seven portraits of noted men of the period, drawn in coloured chalks on tinted paper, most of which were engraved by Bartolozzi and published by Chamberlaine (1792-1800). On his return to Basel (1528), Holbein bought for himself a house, and painted the pathetic, painfully realistic portrait of his wife and two children, now in the Basel Museum. On his second visit to England

About this time Holbein became known to Henry VIII., and painted for him the great family picture of *Henry VII. with Elizabeth of York, and Henry VIII. with Jane Seymour and Children*, that perished in the fire at Whitehall (1698); also the portrait of *Jane Seymour*, now in Vienna. Upon the death of Jane Seymour, he was sent to Brussels to paint the young Christina of Denmark for the king, and in 1539 was sent to Cleves to paint the young princess

same year of a pestilence. Holbein excelled also as a miniature painter. He also executed a series of important cartoons in Indian ink for glass painting. The British Museum possesses seven similar cartoons illustrating the Passion, belonging to his earlier period. Excellent specimens of his numerous designs for domestic furniture, stoves, clocks, etc., for weapons and goldsmith's work, original in invention, belonging in manner to the



Figures from 'The Dance of Death.' By Hans Holbein the Younger.

1. The Councillor. 2. The Preacher. 3. The Ploughman. 4. The Young Child. 5. The Gamester. 6. The Beggar.

(1532) he found powerful patrons in the German merchants of the Steelyard, and among others painted the portraits of *Hans of Antwerp* (Windsor), very delicate in drawing, and the finely finished *George Gysen* (Berlin). To 1533 belongs his masterpiece in portraiture, *The Ambassadors* (National Gallery), a remarkable and characteristic picture, about which much has been written by Ruskin, Sydney Colvin, Eastlake, Wornum, and Miss Mary Hervey.

Anne of Cleves (Louvre). Among the many fine portraits of his later years may be quoted those of *The Duke of Norfolk*, 1539 (Windsor), of the *Surgeon Chambers* (Vienna), and the portrait of himself in the Uffizzi—all admirable examples of the artist's close observation of character, extraordinary finish and elaboration of detail, delicacy of drawing, and clarity of tone. In 1543 he painted his last known picture, a portrait of himself, and died in London in the

style of the renaissance art, are in the museum. See *Hans Holbein*, by J. Cundall (1879); *Some Account of the Life and Works of Hans Holbein*, by R. N. Wornum (1867); *Oeuvre de Jean Holbein*, by C. de Michel (4 vols. 1880-92); *Hans Holbein the Younger*, by G. S. Davies (1903); *Holbein*, by H. Knackfuss (Eng. trans. 1899).

Holbein, MONTAGU A., English cyclist and swimmer. He holds the record with A. E. Walters for the twelve hours'

tandem bicycle race (1897), 230 m., and with J. A. Bennett (1895) for the twenty-four hours' race, 397½ m. With W. F. Shorland he has also the record for the tandem tricycle race from London to York, 13 hours 2 minutes. Till the pneumatic tyre was introduced, he also held the record for the 100 miles on a safety road bicycle. In 1898 he started his career as a swimmer, when he did 43 m. in the Thames in 12 hours 27 minutes 42½ seconds. In August 1902 he twice tried to swim the English Channel, but failed in consequence of the adverse tides. He attempted the same feat again in subsequent years, but without success. Holbein has written *Swimming* (1903).

Holberg, Ludvig, Baron (1684-1754), father of the Danish drama, was born at Bergen in Norway. In 1706-8 he resided in England, where he adopted the English rationalistic philosophy; and a subsequent stay at Paris (1714-15) familiarized him with the best literature of the day. After spending the winter of 1715-16 at Rome, he made his way on foot across the Apennines to Amsterdam, and returned home in the summer of 1716. In 1718 he was given the professorship in metaphysics at Copenhagen, and in 1720 he exchanged that for the chair of rhetoric, and in 1730 exchanged that for the chair of history. Holberg was a born satirist, and his study of the Latin poets, especially Juvenal, led to the appearance in 1719 of the first part of *Peder Paars* (Eng. trans. 1862), a mordantly witty satire. In 1722 Holberg wrote his first five comedies, the last of which, *Den politiske Kandestøber*, was acted for the first time on Sept. 24, 1722, at the first Danish playhouse, just opened. From 1723 he contributed no fewer than eight-and-twenty masterpieces to the *répertoire* of the theatre, till it was closed in 1727. Twenty-three years later the theatre was again opened under happier auspices, and the aging dramatist thereupon presented it with six fresh pieces (ed. 1731-54). Holberg's chief defect as a dramatist is his want of psychological depth; his personages are types rather than characters. The action of his plays, too, is often improbable to absurdity, and his prosaic commonsense was never at home in romantic or erotic scenes. History, however, always remained his favourite study. His *Danmarks Riges Historie* (1732-5), *Almindelig Kirkehistorie* (1738-40), and *Berømmelige Mænds og Hjeltes Sammenlignede Historier* (1739), constitute his best work in this field. The satirist re-emerges in *Nicolai Klimii Iter Subterraneum* (1741; Eng. trans. 1828), trans-

lated into Danish the following year. It is a sarcastic romance, somewhat in the manner of *Gulliver*. The work of his old age was the ever-memorable *Epistler* (1748-54), which, apart from their autobiographical interest, are a striking testimony to the breadth of his knowledge. There is a good ed. of his *Comödier*, with introduction by G. Brandes, and illustrations by Tegnér (3 vols. 1884-88). His *Udvalgte Skrifter* were edited by Rahbek (21 vols. 1804-14), and *Udvalgte Epistler* by Horn (1884). See J. Vibe's *Udsigt over Holberg's Liv* (1884); G. Brandes's *Ludvig Holberg* (1898); E. Holm's *Holbergs Betydning for Aandsliv* (1884); Skavlan's *Holberg som Komedieforfatter* (1872); G. Brandes's *Holberg und seine Zeitgenossen* (1885).

Holborn. See LONDON.

Holcroft, Thomas (1745-1809), English playwright and novelist, born in Leicester Fields, London. He became prompter and strolling player at twenty-five; was afterwards journalist, translator, and writer of comedies, and acted at Covent Garden. His most famous dramas are *Duplicity* (1781); *The Road to Ruin* (1792); *The Tale of Mystery* (1802); *The School for Arrogance* (1791); *He's Much to Blame* (1798); *Hear Both Sides* (1803), etc. He also wrote verses and various books, of which the best known is *Life of Baron Trenck* (1788). He was imprisoned for his revolutionary sympathies.

Holden, Hubert Ashton (1822-96), English classical scholar, was a member of an old Staffordshire family. From 1853-58 he was vice-principal of Cheltenham College, and from 1858-83 head-master of Queen Elizabeth's School, Ipswich. He edited a large number of classical works, and was the compiler of three volumes of selections for translation into Latin and Greek verse, entitled *Foliorum Silvula* (1852), *Foliorum Centurie* (1852; 10th ed. 1888), and *Folia Silvula* (1865-70).

Holden, Sir Isaac (1807-97), Scottish inventor, son of a miner near Paisley. In 1829 he produced lucifer matches; but as he did not patent his invention, others reaped the benefit. In 1846 he became associated with an inventor, Samuel Cunliffe Lister, afterwards Baron Masham, with whom he patented a new method of carding and combing and preparing genappe yarns. He opened a large manufactory at St. Denis near Paris (1848), but eventually concentrated his business at Bradford (1864), where it became the largest wool-combing establishment in the world. He was M.P. for Knaresborough (1865-68), and Keighley (1882-95), and was created a baronet in 1893.

Hölderlin, Johann Christian Friedrich (1770-1843), German poet, born at Lauffen in Württemberg. Falling under the influence of Fichte and Schiller, he took to literary work. His masterpiece is *Hyperion* (1797-9). The 'Diotima' of this classical romance is a lady who engaged Hölderlin as tutor to her children, and when she died he became insane. His *Sämmtliche Werke*, with *Life* by C. T. Schwab, appeared in 2 vols. in 1846, also in 3 vols., with *Life* by Boehm (1905).

Holderness, div. of E. Riding, Yorkshire, England. It returns one member to the House of Commons.

Holding (Scots), expresses the nature of the right given to a vassal, and implies that the land to which the name is given is 'held' under a superior. The principal varieties of feudal holdings that survive are feu, blench, and burgage. In a feu-holding the vassal pays a substantial yearly rent; in a blench-holding the duty is elusory. A burgage-holding is the tenure by which land in royal burghs is held under the crown.

Hole, William (1846), Royal Scottish Academician, was born at Salisbury, Wiltshire, but on his father's death he was taken to Edinburgh. Among his paintings are *End of the '45* (1879), *Prince Charlie's Parliament* (1882), *The Night's Catch* (1883), *The Canterbury Pilgrims* (1883). The best known of his etchings are *Mill on the Yare* (after Crome, 1888), *He is Coming* (after Maris, 1889), and *The Sawyers* (after Millet, 1890). In mural painting he has decorated the chancel of St. James's Church, the interior of the Scottish National Portrait Gallery, and the Council Chambers, Edinburgh. He has painted a large series of water colours illustrating the life of Christ.

Holguin, city, Cuba, 65 m. N.W. of Santiago de Cuba. Pop. (1899) 34,056.

Holidays. See PUBLIC HOLIDAYS.

Holinshed, or **HOLLINGSHEAD**, RAPHAEL (c. 1520-80), English chronicler, lived in London in the reign of Elizabeth as translator for the printing-press of Reginald Wolfe, and when Wolfe planned a *Universal History*, the main part of the work (relating to the British Isles) was entrusted to Holinshed; but William Harrison wrote a description of contemporary England, and Richard Stanihurst helped with the chronicle of Ireland. Holinshed's own *Chronicle* was largely based on the earlier chronicle (1550) of John Halle. The first edition appeared in 1577. In 1887 a second was prepared, with a continuation by John Hooker (alias Vowell), Abraham Fleming, Fran-

cis Thynne, and others. A new edition appeared in 1807-9. His *Chronicle* was one of the sources upon which Shakespeare drew for his historical plays. See W. G. Boswell-Stone's *Shakespeare's Holinshed* (1896).

Holl, FRANCIS MONTAGUE, known as FRANK HOLL (1845-88), English portrait painter, was born in London. At first he painted subject pictures, such as *Hush* and *Hushed* (Tate Gallery, London), and *No Tidings from the Sea*, painted for Queen Victoria. Elected A.R.A. (1878) and R.A. (1884), he thereafter devoted himself to portraiture, especially of men. Samuel Cousins, Lord Wolseley, and Gladstone were among his notable sitters.

Holland, s. div. of Lincolnshire, England.

Holland, KINGDOM OF. See NETHERLANDS.

Holland, NORTH, prov. of Netherlands, between the Zuider Zee and the North Sea. It is flat, low (large portions below sea-level, and protected by embankments or dykes), but is fertile, and produces cattle and cheese, flower bulbs (Haarlem), potatoes, etc. Fishing, shipping, and ship-building are carried on. Area, 1,069 sq. m. Pop. (1899) 968,131. Chief town, Amsterdam.

Holland, SOUTH, prov. of Netherlands, stretches along the North Sea northwards from the Haringvliet or mouth of the Maas. It is low (as much as 16 ft. below sea-level) and fertile, producing cattle and cheese, flowers and fruit, as also bricks, spirits (gin), and carries on shipping and fishing. Area, 1,166 sq. m. Pop. (1899) 1,144,448. Chief town, the Hague.

Holland, city, Ottawa co., Michigan, U.S.A., 6 m. from Lake Michigan. It contains Hope (Reformed) College (1865) and the Western Theological Seminary. Tanneries, saw-mills, and furniture factories. The town is a summer resort. Pop. (1900) 7,790.

Holland, BARON. See FOX, HENRY.

Holland, SIR HENRY (1788-1873), English physician, was born at Knutsford, Cheshire; became physician to Caroline, Princess of Wales (1814), and was afterwards one of the physicians extraordinary to William IV. and Prince Albert, and one of the physicians-in-ordinary to Queen Victoria. He wrote *Travels in the Ionian Islands* (1815); *Medical Notes and Reflections* (1839); *Chapters on Mental Physiology* (1852); *Essays on Scientific and Other Subjects*.... (1862); and *Recollections of Past Life* (1872).

Holland, HENRY SCOTT (1848), English Church clergyman, was born in London; from 1882-4 canon of Truro; and since 1884

he has been canon, and since 1886 precentor, of St. Paul's Cathedral. Among his works are *Logic and Life* (1882; 3rd ed. 1885); *Creed and Character* (1887); *On Behalf of Belief* (1889); *God's City* (1897); *Life of Jenny Lind* (1891); *Old and New* (1903); and *Personal Studies* (1905).

Holland, JOSIAH GILBERT (1819-81), American author, born at Belcherton, Massachusetts; edited the *Springfield Republican* (1849-70), and in 1870 established in New York *Scribner's Monthly* (afterwards the *Century Magazine*). He published a successful *Life of Abraham Lincoln* (1865), some novels, and a number of collected essays from *Scribner's*, such as *Every-day Topics* (1876, 1882), *Letters to the Joneses* (1863), etc.

Holland, PHILEMON (1552-1637), English classical translator, was born at Chelmsford, Essex; became master of the Free School at Coventry, where he also practised as a physician. He is known by his translations of Pliny (1601), Livy (1600), Suetonius (1606), Plutarch (1603), and Xenophon (1632). He was also the translator of Camden's *Britannia* (1610) into English.

Holland, THOMAS ERSKINE (1835), professor of international law in Oxford; was appointed to the Vinerian readership of English law, and subsequently to the international law professorship. In addition to editing the *Institutes of Justinian* (1873), he has written *An Essay on Composition Deeds* (1864), *Elements of Jurisprudence* (1880; 9th ed. 1900), *Studies in International Law* (1898), *The Laws and Customs of War on Land* (1904), and *Neutral Duties in a Maritime War* (1905).

Hollands. See GIN.

Hollandsch Diep, the united Maas and Waal (Rhine), in the Netherlands, between the provs. of N. Holland and N. Brabant. Between S. Holland and the islands of Overflakkee and Goeree, farther w., it is called the Haringvliet.

Hollar, WENCESLAUS (1607-77), Bohemian etcher, born at Prague; was brought to England (1637) by the Earl of Arundel, and in 1640 was appointed drawing-master to the Prince of Wales. At the same time he published *Ornamentus Muliebris Anglicanus*, twenty-eight plates of the dresses of Englishwomen, followed in 1642-44 by the dresses of women in other European countries. He has left etchings of the works of Holbein, Paolo Veronese, Titian, Van Dyck. He also sketched (1673) Lincoln, Southwell, York, Newark, and, in 1668, Tangier for Charles II. See Parthey's *W. Hollar* (1853-8).

Holles, DENZIL, LORD (1599-1680), English statesman and parliamentary leader, born at Houghton in Nottinghamshire. Having entered Parliament (1624), he advocated resistance to unjust taxation and religious innovations, compelling the Speaker to remain in the chair while resolutions in that spirit were passed (1629). For this he was fined and imprisoned in the Tower. He was one of the 'five members' against whom Charles I. imputed treason (1642). Though he took an active share in the civil war, at the end the army men impeached him (1647), but he escaped to France. He played a prominent part at the restoration, and acted as English ambassador in Paris (1663-6), and in 1667 negotiated the treaty of Breda. See his own *Memoirs* (1699).

Hollingshead, JOHN (1827-1904), English author and journalist, born in Hoxton, London; was special commissioner for the *Morning Post* in the East End during the famine of 1861. He acted as dramatic critic of the *Daily News*, *Punch*, and *London Review*. He was the first lessee and manager (1868-86) of the Gaiety, where in 1879 he arranged for the whole *Comédie Française* to appear for six weeks. He was also managing director of *Niagara in London*. See Hollingshead's *My Lifetime* (1895), *Gaiety Chronicles* (1898), and *According to my Lights* (1900).

Holloway, dist., par. of Islington, N. London, Middlesex, England; contains the city prison, built in 1860. The cattle market occupies the site of Copenhagen Fields. See also LONDON.

Holloway College, THE ROYAL, is situated at Mount Lee, Egham, Surrey, England. It was founded by Thomas Holloway at a cost of over £800,000. The building, which was opened by Queen Victoria on June 30, 1886, provides accommodation for 200 students. The college aims at providing full courses of instruction for women in the principal subjects of university education, and prepares students for university degrees. All students must read for honours. There were (1905) 150 students and 24 lecturers and professors.

Holly (*Ilex*), a genus of trees belonging to the order Illicineæ, mostly inhabitants of temperate regions, and extensively grown in British gardens. Their flowers are white, but usually very inconspicuous; but the fruit, a scarlet berry, is often of great beauty. It is chiefly for their foliage that the hollies are cultivated as specimen trees. The common holly (*I. aquifolium*) is also extensively grown as a hedge-plant; it makes, when properly

tended, an almost impassable barrier, but is a slow grower. The species are best propagated by means of seeds, gathered in October and kept in sand till the following May, when they should be sown in drills.

Hollyhock (*Althaea rosea*), a hardy, perennial, herbaceous plant, which was at one time a fashionable flower; but the hollyhock disease obtained such a hold, that named varieties became unpopular, and hollyhocks raised from good strains of seed took their place. It is desirable to sow the seed in light rich soil, in a temperature of 65°, in January or February, potting on as growth occurs until the end of April, when they may be planted out into deep-dug and well-enriched soil. Hollyhocks may also be raised from seed sown in the open in May and June.

Holm, PETER EDVARD (1833), Danish historian, born at Copenhagen; became professor of history (1868), and in 1869 published *Danmarks Politiske Stilling under den Franske Revolution*, and the even more important *Danmark-Norges Udenrigske Historie, 1791-1807* (1875), and *Danmark-Norges Indre Historie under Enevælden fra 1660 til 1814* (4 vols. 1885-93). Professor Holm is also a leading contributor to Steenstrup's monumental *Danmarks Riges Historie*.

Holman, JAMES (1786-1857), English blind traveller, was born at Exeter, and although totally blind, travelled unattended over the greater part of Europe (1819-24), and round the world (1827-32). He published accounts of his *Travels* in 1822, 1823, and 1835.

Holmby House, properly HOLDENBY HOUSE, 6½ m. N.W. of Northampton, England; was built in Elizabeth's reign. Charles I. resided in it from the time of his surrender to the Scots until his removal by Cornet Joyce in 1647.

Holm Cultrum, or ABBEY HOLME, popularly known as Abbey Town, mkt. tn. and par. on the Solway Firth, Cumberland, England. Here a Cistercian monastery was founded in 1150. Pop. (1901) 4,270.

Holmes, EMRA (1839), English writer of poems, tales, and sketches, was born at Cleve in Gloucestershire, and was appointed collector of customs at Fowey in 1877. Among his writings are *Tales*, *Poems*, and *Masonic Papers* (1877), *Amabel Vaughan and other Tales* (1879), and *The Lady Muriel and other Tales* (1886).

Holmes, OLIVER WENDELL (1809-94), American author, born at Cambridge, Massachusetts. In 1835 he began to practise medicine in Boston. In the following year he published his first volume of

Poems. From 1838-40 he was professor of anatomy at Dartmouth College. In 1847 he was appointed to the chair of anatomy and physiology at Harvard, and held it for thirty-five years. To the *Atlantic Monthly* he contributed (1857) the *Autocrat of the Breakfast Table*, which has won for him a lasting fame. His works include, besides the *Autocrat*, the *Professor* and the *Poet at the Breakfast Table* (1860 and 1871), *Elsie Venner* (1861), *The Guardian Angel* (1867), *A Mortal Antipathy* (1885), biographies of *Motley* (1878) and *Emerson* (1884), *Over the Teacups* (1890), *Pages from an Old Volume of Life* (1883), and various collections of *Poems*. In 1886 he paid a second and last visit to the Old World, which he has described in *Our Hundred Days in Europe* (1887).

Holmes was perhaps the most versatile of the American men



Oliver Wendell Holmes.

(Photo by Elliott & Fry.)

of letters who were his contemporaries. As an essayist he must be placed among the first masters of the craft—with Addison and Leigh Hunt. His poetry—particularly the short pieces in the *Autocrat* and the *Professor*—is written with deep human experience; his novels, especially those in which he describes the charms of his homeland, are full of subtle character studies and picturesque local colour; and his speculations and investigations are the products of an original mind. See *Lives*, by W. S. Kennedy (1883), E. E. Brown (1884), and John T. Morse (1896). *Collected Works*, Riverside ed. (12 vols. 1885-6).

Holmes, SIR ROBERT (1622-92), British naval officer, was given a command in the semi-piratical squadron under Prince Rupert in 1649-50. In 1664 he reduced the Dutch African settlements, and

brought about the capture of New York. In the second Dutch war he fought in all the principal engagements. In 1666 he was in command of a squadron which burned the Dutch shipping off the islands of Vlie and Schelling on August 8, and in 1672 was in command of the squadron sent to intercept the Dutch Smyrna fleet in the Channel. In the battle of Solebay, in 1672, Holmes was in command of the *St. Michael*.

Holmfirth, tn., 6 m. S. of Huddersfield, West Riding, Yorkshire, England. Numerous woollen and cloth mills. In February 1852, eighty-one persons were drowned and much property was destroyed by the bursting of the Bilberry Reservoir. Pop. (1901) 8,976.

Holocaine is a local anæsthetic, similar in many respects to cocaine, and is a condensation product of phenacetin and parphenetidin. It is used chiefly in nasal and ophthalmic surgery, and is not to be recommended for subcutaneous use, or for administration by the mouth.

Holofernes, the commander of Nebuchadnezzar's army in the apocryphal book of *Judith*. The story of Judith making her way from the besieged town into his camp, plying him with wine until he fell asleep, and then cutting off his head, is now generally regarded as legendary. The Tübingen school identify Holofernes with the Roman general Lucius Quinctus; more recent scholars think Orophernes, king of the Cappadocians about 160 B.C., may have suggested the name. *Judith* is a religio-patriotic romance of the second century before Christ. See Volkmar's *Das Buch Judith* (1860); Schultz's *Das Buch Judith* (1896).

Holograph (Scots law). A holograph deed or will is one written by the grantor's own hand. Such a deed is held valid without witnesses. It must be signed, except in the case of entries in business books, and should contain a statement that it was written by the grantor. Non-holograph and partly holograph writings may have the advantage of holograph writings if they are expressly or impliedly adopted as holograph.

Holothurians (*Holothurioidæ*), a class of echinoderms comprising certain forms variously known as sea-cucumbers, sea-slugs, trepang, *bêche-de-mer*, the last two terms being applied to certain edible forms. In the holothurians the skeleton is represented only by scattered plates, which—e.g. in *Synapta*—are of very remarkable shape. The body is more or less worm-like, the mouth, surrounded by tentacles, being placed at one

end, and the posterior opening of the food-canal at the other. The water-vascular system often shows reduction, and in Synapta the tentacles are the only representatives of tube-feet; in other forms there are five longitudinal rows of tube-feet. The holothurians often discharge their viscera on very slight provocation; these can then be readily regrown. The British representatives are animals of small size, and of no economic value; but off the coasts of Australia and in parts of the Pacific there occur the forms which are exported to China for use as food—trepanng or *bêche-de-mer*. In certain forms there are present in the posterior region of the body a number of glandular tubes called organs of Cuvier, which can be discharged by the animal, and form in the water viscid threads, whence the name 'cotton-spinner' given to such holothurians. Common British forms are the species of Cucumaria, which may be found between tide-marks in the south of England; the curiously modified species of Psolus; and the pink, worm-like Synapta. The diet consists of floating organisms caught with the tentacles, or of sand. As in echinoderms in general, the development is usually indirect, the young form being known as an auricularia.

Holst, HERMANN EDUARD VON (1841-1904), German historical writer, born at Fellin in Livonia; became professor at Strassburg (1872), at Freiburg (1874), and in 1892-9 held the chair of history at the Chicago University. His chief work is *The Constitutional and Political History of the United States* (8 vols. 1876-92); he also wrote *The French Revolution Tested by Mirabeau's Career* (1894), and *Life of John C. Calhoun* (1892).

Holstein. See SCHLESWIG-HOLSTEIN.

Holstein, KARL CHRISTIAN JOHANN (1825-98), German theologian, born at Güstrow in Mecklenburg-Schwerin; from 1852 held posts as teacher at Rostock gymnasium; professor at Bern high school, and at Heidelberg (1876). The New Testament, and particularly St. Paul, occupied his attention. Chief works are *Zum Evangelium des Paulus und Petrus* (1867); *Evangelium des Paulus* (1880); *Die drei ursprüngliche Evangelien* (1883); *Die Synoptischen Evangelien* (1886).

Holston, river of the E. United States, one of the head branches of the Tennessee. It rises in several streams in S.W. Virginia, and flows in a s.w. direction to its junction with the French Broad, forming the Tennessee, a few miles above Knoxville. Its drainage area is 3,790 sq. m.

Holt, SIR JOHN (1642-1710), English judge, born at Thame, Oxfordshire; was called to the bar in 1663. He soon achieved a reputation as counsel in state trials, and in 1686 was appointed recorder of London. In 1689 he sat in the Convention Parliament, and in the same year became chief-justice of the King's Bench, a position he occupied till his death.

Holtei, KARL VON (1798-1880), German poet and playwright, born at Breslau; he made his debut there in 1819, but abandoned acting for theatrical management and writing, and in 1823 produced *Die Wiener in Berlin* and *Die Berliner in Wien*, and in 1826 *Poems*. From that time until his death he managed different theatres at Berlin, Breslau, Darmstadt, etc., and wrote a number of novels. His most popular work is *Schlesische Gedichte* (1830; 20th ed. 1893). His *Theater* appeared in 6 vols. (1867), and his *Erzählende Schriften* in 39 vols. (1861-6). See his autobiography, *Vierzig Jahre* (1843-50); Kurnick's *Karl von Holtei* (1880); and Storch's *Karl von Holtei* (1898).

Holtzendorff, JOACHIM WILHELM FRANZ PHILIPP VON (1829-89), German criminologist and jurist, born at Vietmiansdorff, in Brandenburg. He was appointed professor of jurisprudence at Berlin University (1861), and at Munich (1873), and strongly advocated the reform of prisons, which he investigated all over Europe. Among his numerous works may be mentioned *Das Irische Gefängnisssystem* (1859; Eng. trans. 1860); *Die Deportationsstrafe im Römischen Alterthum* (1859); *Handbuch des deutschen Strafrechtes* (4 vols. 1871-77); and *Handbuch des Völkerrechts* (4 vols. 1885-89). See Störk's *Franz von Holtzendorff* (1889).

Holtzmann, ADOLF (1810-70), philologist and Germanist, born at Carlsruhe; was tutor to the princes of Baden, and afterwards (1852) professor of the German language and literature and Sanskrit at Heidelberg, where he died. His chief works are *Kelten und Germanen* (1855), *Untersuchungen über das Nibelungenlied* (1854), and *Deutsche Mythologie* (1874).

Holtzmann, HEINRICH JULIUS (1832), German New Testament scholar, born at Carlsruhe. He became professor at Heidelberg in 1861, and in 1874 was called to Strassburg, where he still labours. His marvellous erudition and penetrating intellect have been largely exercised in dealing with the synoptic problem; and it is his solution, more or less modified, which holds the field to-day. (See GOSPELS.) His principal works are *Die Synoptischen Evangelien* (1863); a masterly *Einleitung in das N.T.*

(1885; 3rd ed. 1892); 'The Synoptics,' 'John,' 'Acts,' 'Epistles of John,' and 'Revelation,' in the *Kurzer Hand-Commentar* (1890); and *Neutestamentliche Theologie* (1897).

Holub, EMIL (1847-1902), German explorer, born at Holitz, Bohemia; carried on extensive exploratory work in Africa from 1873, and is author of *Die Kolonisation Afrikas* (1881-2); *Sieben Jahre in Südafrika, 1872-9* (1881; Eng. trans. 1881); and *Von der Kapstadt ins Land der Maschukulumbé* (1888-90).

Holy Alliance, a declaratory undertaking by the sovereigns of Russia, Austria, and Prussia that they would be guided both in their internal administration and in their foreign policy by the lofty principles that make up the ethics of Christianity. The document was drawn up by Alexander I. of Russia, and signed at Paris in September 1815. Alexander I. was at that time greatly under the influence of the fair mystical enthusiast Madame de Krüdener, who indeed claims a principal share in the origination of the document.



The Holy Coat of Treves.

Holy Coat of Treves, an important relic preserved in the cathedral of Treves. Legend declares it to be the 'seamless coat' of Christ, said to have been brought from Palestine by the Empress Helena. Another coat at Argenteuil claims to be the identical garment. In 1512 the relic was ordered by the Pope to be exhibited every seven years, and is said to work miraculous cures. On the last occasion on which it was exposed at Treves, in eleven cases cures were, on unimpeachable medical evidence, effected, for which no natural causes could be detected. See Clarke's *Pilgrimage to the Holy Coat of Treves* (1892), and Korum's *Wunder bei der Ausstellung des Heiligen Rockes zu Trier* (1894).

Holy Cross Mountain, peak of the Rockies, Colorado, U.S.A., in Eagle co., about 15 m. N.W. of Leadville. Rising to 14,000 ft., its main feature is the cruciform appearance of two snow-filled ravines; hence its name.

Holy Grail, THE. See IDYLLS OF THE KING, and GRAIL.

Holyhead, mkt. tn. and seapt. on Holyhead Bay, Anglesey, Wales; is the chief mail-packet station for Ireland. It affords bathing facilities, and has an ancient embattled church (St. Cybi). The harbour of refuge was commenced in 1846 and completed in 1873. The new harbour has an area of 267 ac., and the roadstead affords a further sheltered area of 400 ac. The old harbour lies S. of the new. Area, 6,239 ac. Pop. (1901) 10,072.

Holyhead Island, or HOLY ISLE, an isl. w. of Anglesey, connected with it by causeway. Tre Ardur, on Penrhos Bay, affords sea-bathing, and has golf links. Area, 15 sq. m.

Holy Island (anc. *Lindisfarne*), isl. off E. coast of Northumberland, England, connected with the mainland by a low isthmus. There are ruins of the Priory Church, founded 1094; St. Mary's Church, built 1130; and the castle, erected about 1500. The monastery founded by Aidan in 634, and later associated with St. Cuthbert, was destroyed in 893, and in 1093 replaced by a Benedictine monastery. Area, 1,050 ac. Pop. (1901) 650.

Holy Land. See PALESTINE.

Holyoake, GEORGE JACOB (1817-1906), English social reformer, born at Birmingham. In 1837 he fell under the influence of Robert Owen, and became (1841) one of his most active 'social missionaries.' He was the principal agitator against newspaper stamps (1854), and the compulsory oath (1869). His later years were devoted to the spread of secularism—a system of moral culture without regard to religious beliefs—and the co-operative movement. His chief works are *History of the Rochdale Pioneers* (1837-92); *History of Co-operation in England* (1875); *Logic of Death* (101st ed. 1902); *Self-help a Hundred Years Ago* (1888; 10th ed., with title *Self-help by the People*, 1893); *Limits of Atheism* (1861); *Life of J. R. Stephens* (1881); *The Co-operative Movement of To-day* (1891); *Nature and Origin of Secularism* (1896); and *A History of Co-operation* (1905). See his autobiography, *Sixty Years of an Agitator's Life* (1892), and *Bygones Worth Remembering* (1905).

Holyoke, city, Hampden co., Massachusetts, U.S.A., on the Connecticut R., 85 m. w. of Boston; manufactures paper, textiles, machinery, bicycles, and hardware. Pop. (1900) 45,712.

Holy Roman Empire. It is often said that the Roman empire, founded by the great conquests of the republic, and maintained and cemented by the personal rule of Augustus and

his successors, was broken to pieces in the 5th century by the successive inroads of German tribes, Goths, Vandals, Burgundians, Franks, and others. These German conquests, after a long period of turmoil, resulted in the foundation of the modern European states, whose separate independence is the negation of the idea of universal rule which was embodied in the extensive dominions of the old Roman emperors. The year 476 A.D., when Romulus Augustulus was deposed by the barbarian Odoacer, has been accepted as marking the extinction of the Roman empire, at any rate in western Europe, and has thus come to be regarded as on the whole the best dividing date between 'ancient' and 'modern' history.

But it is certain that contemporaries did not consider that the Roman empire had perished in the 5th century, and did not attribute any very special importance to the events of the year 476. For about a century there had been an administrative subdivision between east and west, one emperor residing in Italy and the other in Constantinople. The abdication of Romulus Augustulus was, in a formal sense, the termination of this arrangement and the restoration of unity. The news was sent to the Emperor Zeno in Constantinople, from whom Odoacer received his titles to rule in Italy, and whose image was imprinted on the coins of the whole empire. The barbarian invaders were so impressed and fascinated by the great tradition of the empire that they accepted it while they were destroying its power. They regarded it as part of the fundamental nature of things, as something that always had existed and always would exist. Thus the emperor in Constantinople became, after 476, the sole head of a united empire, whose distant sovereignty was undisputed, though its actual exercise was impossible in the western provinces. This state of things lasted for nearly three centuries, and might have gone on until the empty form became so unreal and obsolete that it gradually decayed away. But this process of slow decay was interrupted by two events—the growing power of the papacy, and the invasion of Italy by another heathen and barbarous people of German origin, the Lombards. The bishops of Rome, freed from efficient secular control by the absence of the emperors from Italian soil, began, from Gregory the Great (590-604) onwards, to claim, not merely spiritual independence and domination, but also temporal rule over a large part of central

Italy. Upon the papacy fell the main burden of resisting Lombard encroachments during the 7th and 8th centuries. From Constantinople little efficient aid was received after the temporary successes of the generals of Justinian. The consequent alienation of Italy from its nominal rulers was increased when Leo the Isaurian and his successors sought to purify Christianity by prohibiting the worship of images. The consequent iconoclastic controversy resulted in open defiance of imperial authority by the Italian clergy. But the popes had too little military strength to withstand the Lombard rulers without external assistance. Estranged from the east, they sought succour from the great western power which was being built up by the Franks. Gregory III. appealed to Charles Martel, and offered him the titles of consul and patrician. Pippin, who established the Carolingians on the Frankish throne, twice led an army into Italy for the defence of the church; and the alliance of the Frankish dynasty with the bishop of Rome was finally cemented in 800, when Leo III., repudiating the claim of the Empress Irene, who had deposed and mutilated her son, to fill the throne of the Caesars, placed the imperial crown on the brow of Charles the Great. Thus Italy passed under the rule of a German king, whose vast dominions seemed likely to be continuous with western Europe and Latin Christianity.

But the great Frankish power which Charles the Great and his predecessors had built up did not prove sufficiently lasting to be the foundation on which the traditions of the Roman empire could securely rest. Out of the permutations and combinations of territory among his successors three main subdivisions gradually emerge. Western Francia became in time the historic kingdom of France; Eastern Francia became Alemannia, or Germany; while between them was a more shadowy middle kingdom, originally Lotharingia, but ultimately splitting up into a number of separate states, of which part was the kingdom of Burgundy, or Arles, while another part was Italy, though the latter name only concealed a further process of disintegration into innumerable petty subdivisions. During the stormy and confused period of subdivision the idea of the Roman empire in the west came very near to extinction. Even the papacy, which represented the tradition of Roman unity on its ecclesiastical side, sank to the very nadir of its authority and prestige.

Amidst the general anarchy, which seemed likely to make

Western Europe the prey of the Norsemen, the Magyars, and the Slavs, the first movement of reorganization came from Germany. Henry the Fowler (918-936), duke of the Saxons, formed a fairly coherent state by combining the German duchies to resist the barbarian invasions. His son and successor, Otto the Great (936-973), continued his policy, and raised the German monarchy to a commanding place in Europe. To cement his power, he desired to gain the support of the church, and to strengthen the church he must reform the papacy and revive its influence. These interests brought him into Italy. In 951 he assumed the crown of Italy in the old Lombard capital, Pavia, and in 962 he was crowned emperor by Pope John XII. The assumption of the title by a really powerful king marks a restoration of the imperial tradition to something like its old importance.

Otto the Great did not rule such vast dominions as had owned the sway of Charles the Great, but his coronation is in some ways a more memorable event than that of his famous predecessor. From this time the union of the German and Italian crowns was continuous, and this union is the basis of what is historically known as the Holy Roman Empire. The epithet 'Holy' marks the intimate connection with the papacy, which had played such a prominent part in separating east and west, and in maintaining in Latin Christendom the conception of unity under a single authority. It was the papacy which had first given the imperial title to a German ruler in 800, and it was the papacy which again restored the title to the German kings in 962. Whoever was accepted as king in Germany was regarded as potential emperor, but he did not, at any rate in the middle ages, assume the full dignity of *Imperator Augustus* until he had been crowned by the Pope.

Of the two great subdivisions of Charles the Great's dominions the ascendancy of the eastern kingdom seemed assured in the 10th century. One fragment of the middle kingdom—Italy—was annexed by Otto I.; another, the kingdom of Arles or Burgundy, fell in 1032 to one of his successors, Conrad II. There were now four crowns in the possession of the western emperors—that of Germany, assumed after election at Aachen; that of Italy, which Otto wore at Pavia, but was received by his successors at Monza or Milan; that of Burgundy, imposed at Arles; and, finally, the imperial crown, conferred in solemn ceremony by the Pope at Rome. Until this last corona-

tion took place, the highest title of the German king was king of the Romans.

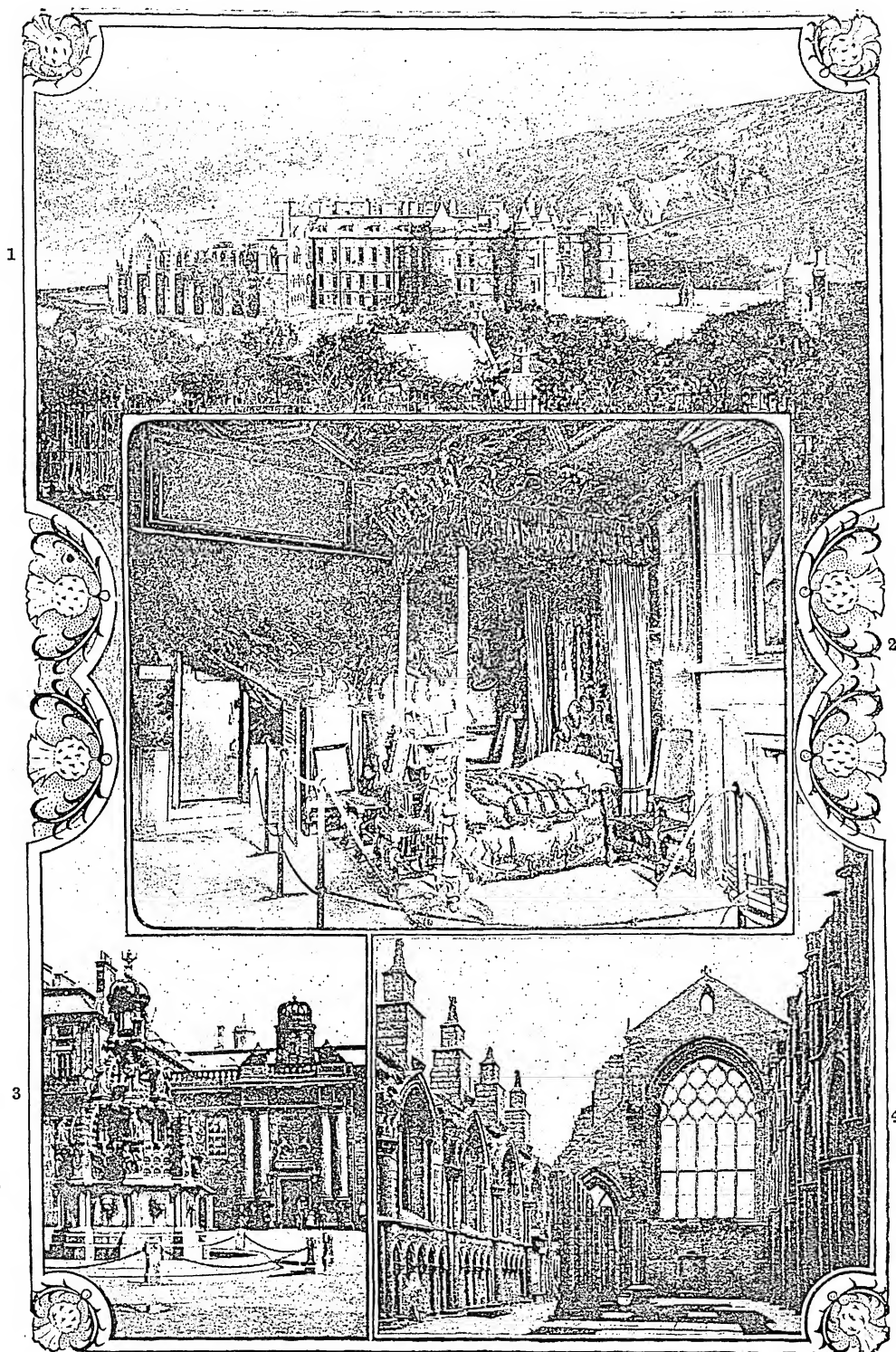
From the first there was something unreal about the Holy Roman Empire, and as time went on it became more and more a shadowy anachronism. In mediæval theory Christendom was a single state under the secular headship of the emperor and the spiritual headship of the Pope. They were the two vicegerents of the Deity. But the claim of a secular prince to universal lordship was of very little practical value. The separate states—such as France, England, Castile, and Aragon—went their own way without any idea of acknowledging external authority. The very fact that the imperial dignity was bound up with territorial rule in Germany was in itself a reason for rejecting its pretensions. In theory any prince could aspire to the office of emperor; and we find French kings, Spanish kings, English princes, among the candidates on several occasions. But the fact that the choice rested with the German princes or electors rendered it almost impossible for alien candidates to succeed; and the one period in which success was nearly achieved, when Alfonso X. of Castile and Richard of Cornwall both claimed the imperial dignity, is known in history as the Great Interregnum (1254-73). And imperial pretensions were not only impeded by the unnatural localization of the grandiose title; they were further weakened by the incessant rivalry between the empire and the papacy. For a time the balance of success rested with the spiritual power, but every victory gained by the popes, from Hildebrand to Innocent III., was a blow to that fundamental idea of unity bequeathed by Rome, on which the claims of both popes and emperors were based.

And if the union of the Roman empire with the German monarchy was fatal to the power of the former, it was equally ruinous to the latter. In the 10th century the German king was one of the strongest territorial rulers in Europe; by the close of the 13th century he had become one of the weakest. The causes of this decline are perfectly obvious. In other states the monarchy became normally hereditary, but in Germany this was impossible, because the imperial office was by tradition and by its very conception elective; and the electors were territorial princes, whose desire for independence made them eager to choose a feeble rather than a strong ruler. The kingship in Italy was a disastrous burden on the ruler of Ger-

many. Over and over again the emperors were impelled to leave their northern kingdom in what proved to be a vain attempt to gain substantial power in the southern peninsula. Germany tended more and more to become a loose federation; and the allegiance of the separate princes to the German king became little more substantial than the purely nominal inferiority of national kings to the Roman empire.

By the 16th century the Holy Roman Empire seemed to be, and was, a complete anachronism. The very conception of unity had been destroyed by the growth of coherent and powerful nations in France, Spain, and England. The reformation put an end to the ecclesiastical unity of western Christendom. Frederick III. (1440-93) was the last emperor who assumed the crown of Italy. The holy crown of Arles had not been worn by any prince since Charles IV. (1346-78), and large portions of the kingdom had fallen to France. Frederick III. was crowned by the Pope in Rome, and his great-grandson, Charles V., was crowned by a pope in Bologna; but the ceremony was never afterwards performed. Of the four crowns of the mediæval empire that of Germany alone remained; and no emperor after Charles V. made any real effort to assert imperial authority outside Germany. The emperors were nothing more than German kings, and even in Germany they had little real power. The empire, as Hobbes put it, was neither holy, nor Roman, nor an empire.

Yet the forms and titles of the Holy Roman Empire were continued with little alteration till the beginning of the 19th century—chiefly because they were so unreal as to excite little jealousy or opposition. There is also another explanation. The idea of the Roman empire was rescued from the chaos of the 10th century by its association with the then substantial office of German king. It was prolonged after the decadence of the 15th century by its association with a singularly successful family. Twice in the 13th century an emperor had been found in the house of Hapsburg, which then established itself in Austria. In 1438 the choice of the electors fell once more upon a Hapsburg, and for two centuries members of this family held continuous possession of the imperial title. One of them, Charles V., acquired by the accident of inheritance such vast dominions as to inspire a fear that something like a universal empire might once more be created. But the bulk of Charles's territories passed to the Spanish branch of his house;



Holyrood Palace, Edinburgh.

1. Holyrood from the Calton Hill. 2. Queen Mary's Bedroom. 3. The Fountain, and entrance to Palace. (Photos by Valentine.)
4. Holyrood Chapel. (Photo by G. W. Wilson.)

and it was the Austrian Hapsburgs, to whom fell the German provinces, who retained such a tenacious hold of the imperial office. Their quasi-hereditary tenure was partly due to the geographical position of their territories, which made them the natural champions of Germany against the dreaded Turk, and may also be attributed to the skill with which many of them secured the election of their sons as 'kings of the Romans' during their own lifetime. When the male line of the Austrian Hapsburgs ended in 1740, a Bavarian prince, Charles VII., held the imperial title for a few years (1742-45), but after his death it reverted to the house of Lorraine, which succeeded by intermarriage to the territories and position of the Hapsburgs.

The great convulsion of Europe, inaugurated at the close of the 18th century by the French revolution, proved fatal to many interesting survivals from the distant past, and among others to the Holy Roman Empire. When Napoleon became emperor of the French, and when his conquests made him supreme in Western Europe, and a dictator in Germany itself, it became obviously preposterous for an Austrian archduke, even though he was also king in Hungary and Bohemia, to bear titles which purported to carry with them the rule of the world. Francis II., bowing to the inevitable, formally resigned these titles in 1806, and consoled himself for his degradation with the preposterous and unhistorical designation of emperor of Austria, which he had already tacked on to his other dignities in 1804. See James Bryce's *The Holy Roman Empire* (1889; rev. and enlarged ed. 1904); Herbert Fisher's *The Mediæval Empire* (1898); Ranke's *Weltgeschichte* (1881-6); Church's *The Beginning of the Middle Ages* (1877); Freeman's *Essays*, first series (1871).

Holyrood, royal palace at Edinburgh, once an abbey, and for centuries the residence of the Scottish sovereigns. The abbey, which has been in ruins since 1688, was founded by David I. in 1128. The palace was commenced about 1501, and is especially famous as the residence of Queen Mary, and the scene of the murder of her favourite, David Rizzio, in 1566. The palace was mostly destroyed by the English in 1544, and partially destroyed by Cromwell in 1650, but was rebuilt (1671-9) by Charles II. after the restoration.

Holy Sepulchre, KNIGHTS OF THE. See HOSPITALIERS.

Holy Spirit, THE, or HOLY GHOST, or PARACLETE—i.e. ad-

vocate—in Christian theology the third person of the Trinity. The doctrine of the Holy Spirit is a distinctively Christian one, but foreshadowings of it are found in the Old Testament. Thus the Spirit of Jehovah is the active divine principle in nature (Gen. 1:2; Ps. 104:30), and the generator of the higher energies of the human soul (1 Sam. 16:13), especially of the prophetic faculty (Isa. 61:1); while the prophets look forward to the Messianic age as the special time for the full manifestation of the Spirit (Joel 2:28 ff.; cf. Acts 2:17 ff.). But it is in the New Testament that we find the bases of the doctrine of the Spirit's personality. The early Christians saw His work in the form of extraordinary gifts, as at the day of Pentecost (Acts 2:4 ff.; cf. 10:44), which inaugurated the new dispensation; for Paul, He is the principle of the divine life in the community (Rom. 8:10 ff.), the begetter of all the spiritual graces (Gal. 5:22). But the Spirit's proper personality is most clearly found in John (14:16-26, the *locus classicus*), though it seems to be already implied in Matt. 28:19, with which should be compared Paul's benediction in 2 Cor. 13:14. Yet the early church did not forthwith attain to a complete doctrine; nor was it, in fact, till after the essential divinity of Jesus had received full ecclesiastical sanction that the personality of the Spirit was explicitly recognized, and the doctrine of the Trinity formulated. Rationalistic writers have usually endeavoured to reduce the being of the Spirit to the presence of the moral faculty in man, but this is to put the matter lower than the facts warrant. It is better to regard the Spirit as the agency which, proceeding from Jesus Christ, dwells in His church as the witness and power of the new life therein; and if we realize this energy as implying the presence of God Himself, the divinity and personality would seem to become intelligible and credible. For the question as to whether the Spirit proceeds from the Father alone, or from the Father and the Son (*filioque*), which ultimately brought about the separation of the Greek and Roman Churches, see GREEK CHURCH and TRINITY. The whole subject is more or less adequately dealt with in books of systematic and Biblical (New Testament) theology. See a concise summary in Moule's *Outlines of Christian Doctrine* (1889), p. 119 f.; cf. also Kahnis's *Die Lehre vom Heiligen Geist* (1847); Swete's *Early History of the Doctrine of the Holy Spirit* (1873), and *History of the Doctrine of the Proce-*

sion of the Holy Spirit (1876); Smeaton's *Doctrine of the Holy Spirit* (1882; 2nd ed. 1889).

Holy Water. The custom of blessing water for religious use seems to have been very early adopted in the church. Tertullian, in the 2nd century, mentions the habit of sprinkling before entering the sacred building, and St. Jerome states that the water so used was ceremonially blessed. In the Roman Catholic Church water is solemnly blessed by the priest or bishop on Holy Saturday. Holy water is placed at the entrance of all Roman Catholic churches, and is also used at funerals, etc. The only remains of the custom of blessing water in the Anglican Church is the prayer in the baptismal service, 'Sanctify this water to the mystical washing away of sin.'

Holy Week. See PASSION WEEK.

Holywell, par., parl. bor., and mrkt. tn., Flintshire, Wales, 15 m. N.W. of Chester; has lead and zinc mines, cement works, lime quarries, and manufactures of copper, iron, machinery, cottons, and flannels. Its 'holy well' is the scene of frequent pilgrimages. Over the well is a Late Perpendicular chapel with vaulted roof, built in 1490 by the Countess of Richmond, mother of Henry VII. In the neighbourhood of the town are the ruins of Basingwerk Abbey, built about 1170. There is a college (St. Beuno's) for the education of Roman Catholic priests. It is one of the Flint parl. bors. Pop. (1901) 2,652.

Holywell Street, a street in London, so named from a 'holy well' in the vicinity. It was at one time the emporium of the mercers, and later was occupied by booksellers dealing in disreputable literature. The street was removed to widen the roadway between St. Clement's Church and St. Mary's le Strand.

Holywood, par. and seapt., Co. Down, Ireland, on Belfast Lough, 4½ m. N.E. of Belfast. Its church dates from 1200. Here was signed in April 1644 a solemn league and covenant.

Holzminden, tn., duchy of Brunswick, Germany, on the Weser, 41 m. by rail N.E. of Paderborn; has sawmills and stone quarries. Pop. (1900) 9,857.

Homage, a formal acknowledgment of allegiance, whereby a vassal proclaimed himself the man (*homme*) of his lord. Noblemen at a coronation, and bishops on appointment, are said to do homage.

Homburg vor der Höhe, tn. and wat.-pl. in Prussian prov. of Hesse-Nassau, stands on the Taunus, 12 m. by rail N. of Frankfurt-on-Main. Pop. (1900) 9,635.

Home, EARLS OF. The first Lord Home (a descendant of Cospatrick, third Earl of Dunbar) was Sir Alexander Home, ambassador extraordinary to England in 1459. Alexander, the third lord (d. 1516), led the van at Flodden along with Huntly (1513). He embraced the English interest as against the Regent Albany, by whom he was inveigled to Holyrood and executed. Alexander, the fifth lord (d. 1575), a supporter of the reformation and Moray's party, joined the queen's friends (1569), and was active on her side. Alexander, the first Earl of Home (?1566-1619), was a Privy Councillor of James VI., with whom he went to England (1603). The third earl joined the association in favour of Charles I. at Cumbernauld (1641), and during the civil war maintained so steady a loyalty as to render him obnoxious to Cromwell, by whom he was ordered to surrender Home Castle.

Home, DANIEL DUNGLAS (1833-86), spiritualist medium, born near Edinburgh. His *séances* in America and Europe were attended by crowned heads and eminent men of science. Two of the latter, Sir W. Crookes (1871) and Professor von Boultrow, attested the genuineness of the phenomena. See *Sludge the Medium*, by Browning (1864); *Incidents of my Life*, by Home (1863-72); *Life*, by Madame Home (1888); *Gift of D. D. Home* (1890).

Home, HENRY. See KAMES.

Home, JOHN (1722-1808), Scottish dramatist, was born at Leith. Appointed in 1747 minister of Athelstaneford, E. Lothian, he wrote (1749-54) his dramas, *Agis* and *Douglas*, which were both declined by Garrick. *Douglas*, however, was enthusiastically received on the Edinburgh stage in 1756. In 1760 he published a third play, *The Siege of Aquileia*. These, with three others, were issued in two volumes in 1798. He left a curious diary of his sojourn at Bath with David Hume when an invalid. He published in 1802 a somewhat thin *History of the Rebellion of 1745*. His reputation rests on *Douglas*, which he based on the then popular Scottish ballad of *Childe Maurice*, the *Gil Morris* of Percy's *Reliques*. Voltaire's comedy *L'Ecossoise* (1760) is professedly a translation from him. Home's *Works*, edition with *Life* by Henry Mackenzie, appeared in 3 vols. (1822).

Home and Colonial School Society was established in 1836, largely through the efforts of Mr. John Stuckey Reynolds (1791-1874). Its main object was to provide teachers specially prepared to educate infants, and to introduce the principles of Pestal-

ozzi into English schools. In practice, however, it became a Church of England institution. It has now a school at Wood Green, and a college for training mistresses at Highbury Hill, both in the north of London.

Home Arts and Industries Association, founded in November 1884, aims at teaching the various crafts to children of the poorer classes by gratuitous tuition. It holds an annual exhibition of work at the Royal Albert Hall, London, in May.

Home Colonization Settlement, an attempt (1892), on a farm of one hundred and thirty acres between Windermere and Kendal, to form an industrial, self-maintaining village for the benefit of the unemployed. The 'colonists' are also engaged in hand-loom weaving, corn-milling, and the manufacture of peat-moss litter.

Homel. See GOMEL.

Home Office. Between 1688 and 1782 matters of internal concern were within the province of the Secretary of State for the Southern States of Europe. In 1782 they were placed under the Secretary of State for the Home Department, who was also Secretary at War. He was relieved of most of his military responsibilities in 1794; but as late as the Crimean war (1854) he was still charged with the administration of the militia. Colonial and Irish affairs also continued to be in his province until 1801. He is now charged, generally, with the maintenance of order and the repression of crime in England and Wales. He has control of all prisons and convict establishments; and he is also charged with the administration of the Factory Acts, the Coal and Metalliferous Mines Acts, the Poor Law Acts, the Reformatory and Industrial Schools Acts, the Explosives Acts, the Inebriates Acts, the Vivisection Act, the Prevention of Cruelty to Children and to Animals Acts, the Burial Acts, and the licensing laws. The most exacting and anxious of his duties is the exercise of the prerogative of mercy. Nominally, this prerogative, whether in reference to the capital sentence or to sentences of imprisonment, rests with the crown; but in England and Wales it is exercised only on the advice of the Home Secretary. He is the medium through which the sovereign acquaints his people with his pleasure; addresses to the crown and the replies thereto are forwarded through him; and it is his duty to certify the birth of a prince or a princess either to the sovereign or to the Prince of Wales. The Home Secretary is always a member of the cabinet.

Homer, the author of the *Iliad*, probably lived in the 12th century B.C. (see below). His birthplace is doubtful; even in antiquity seven cities contended for the honour—Cyme, Smyrna, Chios, Colophon, Pylos, Argos, Athens; another list substitutes Ithaca for Cyme. Here we will only assume that Homer was a native of the mainland of Greece. In addition to the *Iliad*, the Greeks in early times (say the 5th century B.C.) ascribed to Homer many other works—the *Odyssey*, of course, the *Homeric Hymns*, the *Batrachomyomachia*, or *Fight of the Frogs and Mice*, the *Margites*, the *Thebaid*, and *Epigoni* and the *Epigrams*, and several of the so-called 'cyclic' poems. Gradually, however, perhaps as early as the 4th century B.C. (though Aristotle still ascribes the *Margites* to Homer), certainly by the 3rd century, the list was restricted to the *Iliad* and the *Odyssey* alone. Indeed there is no doubt that all the other works are of later date and different authorship; even the *Hymns* are never now regarded as Homeric, as they contain frequent references to later beliefs and customs, and to places unknown to Homer.

The *Iliad* tells the story, not of the whole Trojan war, but of some of the chief events in the last of the ten years of its duration; it does not, however, narrate the final episodes of the contest. Its subject is indeed indicated by its first line, which calls on the Muse to sing of the wrath of Achilles. The subject of the *Odyssey* is the return of Odysseus from Troy to his home in Ithaca. Owing to various reasons, it was delayed for ten years, during which he wandered far and wide, and lost all his comrades. The subject of each poem possesses a remarkable unity; for though there are episodes in both poems, in each they are skilfully subordinated to the main interest. This unity of treatment is not the least of the evidences of the genius of Homer. Next to this unity of treatment we may place his command of a varied, expressive, and harmonious vocabulary, which enables him both to describe, with a simplicity which never descends to vulgarity, the most ordinary actions of life, and at the same time to express with unsurpassed sublimity the heroic actions and passions of his heroes. This command of language is nowhere more prominent than in the speeches of his leading characters, those of Achilles in the ninth book of the *Iliad* being models of rhetorical force. Then we must observe his dramatic power, which has made his chief characters—Achilles, Hector,

Agamemnon, Nestor, and Odysseus—live as do few personages in authentic history; the pathos which is shown in his descriptions of natural human affection, exhibited in the conversations of Hector and Andromache, and the laments over the dead Hector uttered by his wife, his mother, and Helen, and in many other passages; the marvellous art by which, while never condoning the guilt of Helen, he yet wins for her his reader's love, and justifies her place as his heroine; his perfect purity and deep religious feeling, his practical wisdom and sound morality, which made his poems the Bible of Greece; the accurate observation of nature, which lends to his similes their profusion, their vividness, and their truth; and, finally, that indescribable freshness and naturalness, almost amounting to naivete, which makes us feel that he lived in a young and unjaded world, to which every sensation was a novelty, and melancholy and boredom were unknown. Besides all this, there is the perfection of his verbal form, which is conveyed to our ears through the medium of the hexameter, that incomparable measure which the Greek language alone can show in its perfection, as its invention is among the chief glories of the Greek genius. In fact, for the combination of perfect rhythm, noble language, and lofty thought, Homer remains unequalled.

From a very early time the Homeric poems were studied with great care—e.g. by the poet Antimachus and the philosopher Aristotle, and especially by the three great Alexandrian critics, Zenodotus, Aristophanes, and Aristarchus, whose lives roughly cover the period from 260 to 150 B.C. Of these, Aristarchus was much the greatest: he not only amended the text, but also fully commented on it. It was he who divided the *Iliad* and *Odyssey* each into twenty-four books. He also refuted, as was held, the Choriizontes, or 'separators,' who assigned the two poems to different authors; and thus established the traditional views of the authorship of the poems which obtained until the time of the great German scholar Wolf, who opened the modern Homeric question in the preface of his edition of Homer in 1794. Wolf held that the *Iliad*—for the question primarily affects that poem—could not have been composed in a primitive age, when writing was unknown; besides, Peisistratus, who ruled at Athens in the 6th century B.C., is said to have collected the scattered poems of Homer, and therefore Wolf contended there was no one

Homer. This theory has been greatly weakened, if not entirely overthrown, by recent discoveries. We know now that Greek society in the time assigned to Homer was by no means primitive, but an advanced civilization, especially suited, with its wealthy and luxurious courts, to foster poets to sing of its glorious deeds; also that writing is far older in Greece than Wolf supposed (though, apart from that, it is now known that long poems—e.g. the *Parzival*—have been transmitted orally for centuries); and, finally, the story about Peisistratus has no authority earlier than Cicero, and may well be dismissed as a myth. Wolf's theory was elaborated by many followers. Lachmann, for example, ventured to divide the *Iliad* into twenty-two original lays. Grote, the historian of Greece, held that the original poem was an Achilleid, not an *Iliad*—the story of Achilles, not the story of Troy—and that it was comprised in bk. i. and bks. xi.-xxii. of the *Iliad*. With various modifications, this is the prevailing view among later critics, who, however, usually give the title the 'Menis' or 'Wrath' to the original poem which they postulate. Mr. Leaf, for example, considers the original poem to have consisted merely of bks. i., xi., xv., xvi., and xx.-xxii., or rather only parts even of them, as he detects later additions also in these books. His belief is founded on the same inconsistencies that Grote observed, the evidence of language, etc., and the story of Peisistratus's recension. The later books he regards as additions of various dates and by different hands, which gradually in the process of recitation by rhapsodists became incorporated into one body of epic poetry. Professor Bury differs from this view merely in regarding the later books as the work of one poet, who was the real Homer (whether or no that was his name), who was a native of Chios, and lived in the 9th century B.C. Against these views it may be urged that it is impossible to join properly the 1st and the 11th books, and the 11th with the other books assigned to the original poem; and every critic makes a different connection. Again, the 'Wrath' as thus composed entirely lacks the feminine interest given by the character of Andromache and Helen—one of the chief charms of the *Iliad*; the 9th book, which is supposed to involve the main inconsistency, is necessary to the development of Achilles's character; finally, Mr. Leaf's theory makes Achilles's wrath endure only twelve days, but one of which was a day of

fighting. Besides, it is significant that the so-called cyclic poems presuppose the existence of the *Iliad* as we have it, by completing the tale of Troy both before and after the period covered by the *Iliad*, which therefore must have existed as a whole by about 750 B.C., the date of the *Cypria*. Above all, the general unity of language, style, tone, and thought shown in the poem outweigh the evidence of trivial inconsistencies. Thus we may yet believe in the authenticity of the *Iliad* as a whole, as the work of one great poet, while admitting the possibility of large interpolations, such as that of bk. x., which is a mere episode, and undoubtedly later. (With these views compare those set forth at EPIC.) But that the *Odyssey* is the work of the same poet can hardly be seriously contended. Its later date is shown by its tacit recognition of the existence of the *Iliad*, its imitation of phrases in the *Iliad*, its nearer approach to later Greek in point of grammar, its wider vocabulary, especially in the use of words denoting condition or occupation, moral and intellectual qualities, etc., its different view of the gods and its variations in mythology, and its wider geographical knowledge. We must, therefore, hold that Greek epic poetry can boast of two authors, not one alone, of supreme genius. The unity of the *Odyssey* would seem to be beyond attack. But critics have attempted to divide it into a Telemachy, or story of Telemachus, as distinct from that of Odysseus; of these Sittl is the most important. However, their success in disintegrating the poem has been so slight that a mere mention of the theory is sufficient.

The language of Homer is usually called old Ionic; but in recent years Fick has pointed out that it contains a number of Æolic forms, and he has formed a theory that the poems were originally composed in Æolic Greek, and afterwards translated, so to speak, into Ionic. He has even attempted to rewrite Homer in the original Æolic. But any Æolic forms it presents can be as well accounted for by the theory that it was composed in the Greek of 1200 to 1000 B.C. as by Fick's theory. Certainly the poems of Homer show the Greek language at a very early stage as compared with Attic Greek.

This brings us to the question of the poet's date, which is closely connected with that of the epoch of the civilization now called Mycenaean. Of the following facts we may be certain:—Homer was long anterior to the cyclic poets (750 B.C., and later) and to



*Bust of Homer, the great Greek poet (12th century B.C.), found at Herculaneum ;
now in the National Museum, Naples.*

Hesiod (800 B.C.), and knew nothing of Greek colonies in Asia (11th century B.C.) or elsewhere, or of the Dorian invasion of the Peloponnesus, usually dated at about 1100 B.C., and therefore was earlier than the date last mentioned. It seems as if the civilization with which he was familiar resembled closely the Mycenaean. In some respects, however, especially in regard to the armour used by his heroes, he appears to belong to a later date than that of which the discoveries of Schliemann and others have found evidence. We may, therefore, assume that he was contemporary with the last century of that civilization—viz. the 12th before Christ—without necessarily supposing, as Professor Ridgeway does in his *Early Age of Greece*, that an Achaean period succeeded the Mycenaean and preceded the Dorian, and that it was the Achaean period in which Homer lived, although he adduces many interesting arguments in favour of his belief. In any case he assigns the same date to Homer as that given above, and holds, further, as we do, that Homer himself was a Greek of the original stock which developed the Mycenaean civilization.

The best editions of the *Iliad* and the *Odyssey* are: Text of the *Iliad*, Monro (1896), Van Leeuwen and Da Costa (1895-6), Fick (1886); text of the *Odyssey*, Monro (1896), Ludwig (1891), Van Leeuwen and Da Costa (1893). The *Hymns*, Monro (1896), Goodwin (1893). *Batrachomyomachia*, Monro (1896), Ludwig (1896). With notes—the *Iliad*, Leaf (1886-8; new ed. 1901), Monro (1894). The *Odyssey*, Hayman (1882), Merry (1887-8), Ameis-Hentze (1889-91), Way (1904); bks. i.-xii., Merry (1888); bks. xiii.-xxiv., Monro (1901). The *Hymns*, Gemoll (1886). Of translations into English, besides the older works of Chapman (new ed. 1897-8) and Pope (new ed. 1899), there are Lord Derby's *Iliad* (6th ed. 1867), Blackie's *Iliad* (1868), Worsley's *Odyssey* (1895), Way's *Iliad* (1885-8), and William Morris's *Odyssey* (1901), in verse; and in prose, Lang, Leaf, and Myers's, *Iliad* (1883), and Butcher and Lang's *Odyssey* (1887)—these last most faithfully represent the original. For information on the Homeric question, the above-mentioned editions must be consulted, and also the works of Nitzhorn (1869), Kirchhoff (1879), Wilamowitz-Möllendorf (1884), Niese (1882), and the original work of Wolf (*Prolegomena ad Homerum*, 1795; 3rd ed. 1884), among German critics. Lang's *Homer and the Epic* (1893) is the best résumé in English of the question; Jebb's *Introduction to*

Homer (1888) and Leaf's *Companion to the Iliad* (1892) touch on the question, and also on the study of Homer in general. Here also should be mentioned C. Robert's *Studien zur Iliad* (1901), and W. E. Gladstone's *Studies on Homer* (1858). For textual criticism, Lohrs's *De Aristarchi Studiis Homericis* (3rd ed. 1882), Ludwig's *Aristarchs Homerische Textkritik* (1884), and La Roche's *Homerische Untersuchungen* (2 vols. 1869-93) are the chief authorities. For grammar, Monro's *A Grammar of the Homeric Dialect* (1891) is the best authority. Antenrieth's *Homeric Dictionary* (Eng. trans. 1877; new German ed. 1902) ought to be mentioned. Compare generally also Ridgeway's *Early Age of Greece* (1901).

Home Rule. The earlier stages of the agitation for Irish self-government are represented by the repeal movement of Daniel O'Connell, the Young Ireland rebellion of 1848, and the Fenian rising twenty years later. It was not till 1870, just after the introduction of Mr. Gladstone's first Land Bill, that the modern home rule movement came into being. In the Parliament of 1874 organized obstruction first came into being as the settled policy of the party in the House of Commons. Its real inventor was Mr. Joseph Biggar, member for Cavan. He was soon joined by a notable recruit in Charles Stewart Parnell, and in those early days Biggar and Parnell stood almost alone in their fight with the House of Commons—for it was literally a fight with the house as a whole, and not merely with the government. On the death of Butt, in 1878, Parnell became the real leader of the Nationalists. In the meanwhile agrarian outrages took place all over Ireland, many of them of peculiar atrocity. The government declared that they were mainly the result of the teaching of the Land League, the establishment of which was the first extra-parliamentary work of the new party. Early in the session of 1881, Mr. Forster, Chief Secretary for Ireland, introduced a Coercion Bill, and this was followed in April by the Land Bill, which established a land court or commission for the fixing of fair rents. Still the agrarian agitation went on: the Land League issued the famous 'no-rent' manifesto, and the government felt compelled to take action against its leaders. In October Mr. Parnell and several of his colleagues were arrested and thrown into Kilmainham jail. Shortly afterwards Mr. Parnell was released, and Mr. Forster resigned the post of Chief Secretary. But on the evening of May 6 Lord Frederick Cavendish, the new Chief Secretary,

and Mr. Burke, the permanent under-secretary, were assassinated in Phoenix Park by a band of miscreants belonging to one of the secret societies with which the country was honeycombed. The government had the support of all parties, with the exception of the Nationalists, in the steps they at once took to strengthen the criminal law of Ireland. The general election of 1885 greatly strengthened the party of Parnell, and he held the controlling influence in the House of Commons. Mr. Gladstone, on April 6, 1886, introduced his Home Rule Bill. Its immediate effect was to break up the old Liberal party. At the same time the government brought in a bill to settle the land question, by buying out the landlords wholesale with the help of British credit. The defeat of the Home Rule Bill on June 7, 1886, sealed the fate of the ministry. Then came the charges of complicity in the Phoenix Park murders and other outrages made against the Irish leaders in a series of articles in the *Times* entitled 'Parnellism and Crime.' These charges were reinforced by the publication of certain alleged facsimile letters from Mr. Parnell himself. A special commission was appointed to investigate the question. But the letters were proved to be forgeries, and the forger, a man named Pigott, after full confession committed suicide. Then an Irish ex-member of Parliament, Captain O'Shea, brought a suit for divorce against his wife in the English courts, and the co-respondent was Charles Stewart Parnell. The suit was practically undefended, and the revelations made in the course of the proceedings created an instant and complete revulsion of feeling. Mr. Gladstone wrote his famous letter to Mr. John Morley, expressing his inability to carry home rule unless Parnell retired from the leadership of the Irish party, and the break-up of that hitherto solid phalanx followed. The general election of 1892 placed Mr. Gladstone in a majority, and he brought in his second Home Rule Bill in 1893. The bill passed its third reading, but met with speedy shipwreck in the House of Lords, being rejected there by an overwhelming majority. Since the crushing defeat of the Liberal party at the polls in 1895 the home rule question has been in abeyance; but though the gift of local government to Ireland in 1898, and the Land Purchase Bill of Mr. A. J. Balfour's government, have considerably changed the conditions of the problem, home rule is still advocated by a section of the Liberal party.

Homestead, bor., Allegheny co., Pennsylvania, U.S.A., on the Monongahela, 6 m. S.E. of Pittsburgh. The iron and steel works of the Carnegie Company, situated here, are among the largest in the world. Homestead was in 1892 the scene of a great strike, attended by such rioting as necessitated the interference of state troops. Pop. (1900) 12,554.

Homicide. See MANSLAUGHTER and MURDER.

Homildon Hill, one of the Cheviot heights, near the village of Homildon or Humbleton, 1 m. N.W. of Wooler, Northumberland, England. Here (Sept. 14, 1402) Douglas, with an army of 10,000 Scots, was attacked by an English force under Hotspur and the Earl of March, and defeated with great slaughter.

Homily. In the Jewish synagogues the reading from the prophets was succeeded by a sermon. (See Edersheim's *Life and Time of Jesus*, vol. i. p. 445.) The Christian church made full use of the sermon. Origen's *Homilies* are early specimens (3rd century). The Homilies of the Church of England are a series of sermons commenced in 1547, for the use of unlearned preachers, and to ensure uniformity of doctrine in that unsettled age. See Article xxxv., which gives the list and titles.

Homocercal, name applied to the tail of fishes when the upper and lower lobes are of equal size, and there is no apparent upward bending of the vertebral column. Development shows that in such cases the vertebral column is really bent upwards, but the apex atrophies, and the great development of the ventral rays produces an apparent symmetry. The homocercal tail is found in most teleosteans and in some ganoids. It is associated with a terminal mouth, and with life in mid-ocean, giving the fish a complete mastery over the element. Examples may be seen in cod, mackerel, haddock, and other fish. See HETEROCERCAL.

Homœopathy (from the Greek word *ὁμοπαθεῖα*, like suffering), as a principle for the selection of medicines in disease, was definitely formulated by Samuel Hahnemann in the year 1810, after prolonged observation and experiment. The practical bearing of the doctrine of homœopathy is expressed in the Latin phrase *similia similibus curentur*—'let likes be treated by likes.' Hahnemann fully acknowledged that several previous writers had alluded to a similar principle of drug action—viz. that some relation existed between the disease-producing action of drugs and their curative power. But he was the first to demonstrate

systematically the correspondence between the symptoms caused by any given drug administered to a healthy person, and its power of curing a like set of symptoms in the sick. The principle enunciated by Hahnemann has been adopted by an increasing number of physicians in all parts of the world, and notably in America, where homœopathy is officially recognized and best developed. Many old-school authorities have adopted homœopathic remedies, and to a certain extent dosage, into their text-books, obviously as the result of the teaching of Hahnemann. The extreme subdivision of the atoms of compound molecules seems to liberate their energy. Hahnemann pointed out that health and disease are dynamic in nature, originating in molecular and vital forces which are more capable of being acted upon by medicinal agents attenuated according to his method, than by the same substances in a crude state.

Homologation, in Scots law. By a course of action, or even in some cases by a single act, a man may make himself responsible for obligations contained in a deed which suffers from informality or lack of legal precision. This is called homologation. It does not apply to deeds intrinsically null—as, for example, forgeries.

Homologous Series, in chemistry. The hydrocarbons and their derivatives are remarkable as occurring in families of apparent unlimited size, between the members of which there is a constant difference of composition. Thus the paraffins, alcohols, fatty acids, etc., form such series, each member and the next higher or lower differing in composition by CH_2 : for example, the first members of the paraffins are CH_4 , C_2H_6 , C_3H_8 , C_4H_{10} , etc., the general formula being $\text{C}_n\text{H}_{2n+2}$; and, in the same way, the general formula for the alcohols is $\text{C}_n\text{H}_{2n+1}\text{OH}$, and for the acids, $\text{C}_n\text{H}_{2n+1}\text{COOH}$; and so on for other classes of compounds. The members of a homologous series are very similar in properties and methods of preparation, at all events for those that are not very far removed from each other in composition.

Homology, in morphology. When two organs are similar in structure and development, though not necessarily in function, these organs are said to be homologous. Thus, in the common lobster all the appendages of the body develop in the same way, and are essentially the same in structure. They are, therefore, said to illustrate serial homology, though the functions they perform are manifold. The great claw is homologous with

the little 'baler' (second maxilla), whose use is to cause a current of water over the gills; the tactile antennæ are homologous with the swimmerets; and so on. With this conception of homology should be contrasted that of analogy.

Homœousian and HOMŌIOUSIAN, two terms, meaning respectively 'of the same substance' (with God) and 'of similar substance,' which formed the party watchwords of the great church controversy of the 3rd century regarding the nature of Christ. The former was adopted by the Athanasians, the other by the Arians or rather the semi-Arians. There was an extreme group of the Arians known as Anomœans, who denied even resemblance between Christ and God. See ARIUS, ATHANASIUS.

Homoptera, the name applied to a suborder of Hemiptera, including insects whose fore wings generally resemble the hind wings. The position of the head also differs slightly from that found in Heteroptera. Examples of Homoptera are cicadas, lantern flies (*Fulgoridæ*), aphides, and Coccidæ, or scale insects. Many of the Homoptera cause great destruction among cultivated plants. Such useful products as cochineal, lac, manna, white wax, etc., are a very inadequate return for all the mischief caused by them. Manna, or man, is apparently a form of 'honeydew,' a substance excreted by many Homoptera. See APHIS, COCCUS INSECTS, and PHYLLOXERA.

Homotaxial deposits are such as contain the same suite of fossils. Professor Huxley pointed out that very different assemblages of animals and plants inhabit different regions of the globe, and some of the existing faunas (that of Australia, for example) resemble more closely that of Europe in the early Tertiary epochs than in the present day; hence, he argued, the mere fact that two series of rocks in different regions contain similar assemblages of fossil remains does not prove that they were simultaneously deposited. He proposed to call them homotaxial. There can be no doubt there is much truth in his views; but the importance of such exceptional facts can easily be overrated. •

Homs. See HEMS.

Ho-nan, prov., Central China, is traversed by the Yellow R., and by ranges of mountains to the south of it. The greater part is, however, level. Ho-nan is thickly populated, especially in the portion between the Yellow R. and Shan-si, which is spoken of by Richthofen as 'the garden of China.' The S.E. of the province is liable to flooding by the

Yellow R., and after the floods of 1887 the population was reduced by several millions. The coal fields of Lu-shan and Ju-chou in the w. promise good results. Kai-feng-fu is the seat of government. Ho-nan-fu and Huai-king-fu are equally important as commercial centres. Area, 65,104 sq. m. Pop. (1894) 21,000,000.

Ho-nan-fu, city in Ho-nan, China, on the Lo R., a trib. of the Yellow R. Under the name of Lo-yang it was the capital of China in the Chou and later dynasties.

Honawar, or **HONORE**, small seapt. on w. coast of India, N. Kanara dist., Bombay Presidency, 90 m. S.S.E. of New Goa. Pop. (1901) 6,929.

Honda, tn., Tolima, Colombia, at the head of navigation on the lower Magdalena, 60 m. N.W. of Bogotá. Alt. 690 feet. Pop. 5,000.

Hondecoeter, MELCHIOR DE (1636-95), Dutch painter, born at Utrecht. He painted birds, especially poultry, with remarkable skill. *The Floating Feather*, his most celebrated picture, is in the Amsterdam Gallery.

Hondo. See JAPAN.

Honduras, republic of Central America, extending between the Pacific and Atlantic oceans S. of Guatemala. In the S. is a range of volcanic mountains, and two other ranges occupy the N. portion. The forests yield timber, coconuts, rubber, dyewoods, sarsaparilla, etc., and bananas are cultivated in large quantities. Coffee is less extensively planted. Silver and a little gold are obtained. The population is largely composed of half-breeds, together with a few Indians. Animals, animal products, minerals, etc., were exported in 1905 to the value of £494,578; while the imports were £472,552. The ports are Puerto Cortes, Trujillo, and Omoa, on the Gulf of Mexico, and San Lorenzo and Amapala, on the Pacific. Mules and oxen are the common beasts of burden. The government is a republic, with a president elected for a term of four years, and a congress of deputies. The seat of government is Tegucigalpa. Honduras is burdened with a heavy external debt of £5,400,000, plus £15,216,500 interest unpaid since 1872. Area, 46,400 sq. m. Pop. (1901) 744,901. See Lombard's *The New Honduras* (1887); C. Charles's *Honduras* (1890); Soltera's *A Lady's Ride across Spanish Honduras* (1884).

Honduras, **BRITISH**. See **BRITISH HONDURAS** and **BELIZE**.

Honduras, **GULF OF**, an indentation of Central America, between British Honduras on the N.W. and Guatemala and Honduras on the S.

Hone, WILLIAM (1780-1842), English author, born at Bath. For writing a travesty of the Prayer-book he was thrice prosecuted for blasphemy, but was acquitted. His efforts as a social reformer were equally unprofitable. His works include *The Apocryphal New Testament* (1820), *Ancient Mysteries Described* (1823), *Everyday Book* (1826-7), *Table-Book* (1827-8), and *Year-Book* (1832), the last three full of curious antiquarian lore. See his autobiographical *Early Life and Conversion* (1853).

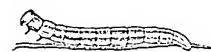
Hones (popularly called whetstones or oilstones), implements for sharpening knives and other cutting instruments. The best are those of Turkey in Asia, Arkansas, U.S.A., and Scotland.

Honesty, or **LUNARIA**, a genus of hardy cruciferous plants, one of which (*L. biennis*) bears racemes of large, scentless lilac flowers in early summer, followed by flat, elliptical pods, the central semi-transparent partitions of which remain after the seeds and walls of the pod have fallen. The perennial *L. rediviva* bears smaller lilac flowers, which are fragrant. Both species are easily grown from seeds.

Honey. The sweet syrup produced by bees and other insects is both vegetable and animal in origin. The nectar procured from the flowers contains chiefly cane sugar. This is collected in the bee's mouth, passes to the crop or honey-bag, and when ejected into the comb has become largely 'inverted,' its composition being approximately: dextrose and levulose, 70 per cent.; water, 20 per cent.; and about 10 per cent. of other components. There is great variety in the quality of honey. The product of spring excels that of summer, while autumn honey is inferior to both. 'Virgin honey' is the best in quality. This is a clear, colourless to pale yellow, syrupy liquid, that has been extracted by draining from the comb. An inferior quality is obtained by pressing and heating the comb, or if the comb has been used for larvae. Both comb and honey keep without decomposition, but turn yellow with age, and the proportion of crystallizable sugar increases. The flavour depends greatly upon the flowers which have supplied the nectar. Clover and heather honey are easily distinguished; while Trebizond honey, collected from the *Azalea pontica*, has poisonous qualities. Solutions of honey, if in presence of sufficient nitrogenous matter, can be fermented, and yield such alcoholic liquors as mead. See **BEES**.

Honey-buzzard (*Pernis ptilorhynchus*), a member of the Falconidae, which ranges throughout

Europe and Asia, and migrates in winter to Africa. It visits Britain as a rare migrant. It differs from the typical buzzards in the shortness of the feathers on the lores, or space between bill and eye. The gait is peculiar, and the bird feeds upon the ground, where it devours bees, wasps, and their grubs from the comb, as well as small birds and mammals, slugs and worms. The plumage is very variable in colour, and the total length of the body is about two feet. The eggs are glossy white, marked with brown or red.



Honeycomb Moth and Caterpillar.

Honeycomb Moth (*Galleria cerella*), a destructive insect whose caterpillars feed upon beecomb, and are often a great pest in hives. The larvae are soft, except in the anterior region, and weave silken tunnels, in which they live. Only the head and thorax are protruded from this shelter, the animal adding to its tunnel as it progresses in the work of destruction. The adult is an insignificant and soberly-coloured moth, which appears first on the wing in May. As there are two broods in the season, other moths appear in full summer.

Honey-dew, a sweetish substance secreted by many Homopterous insects, especially by aphides. The fluid appears in drops at the end of the abdomen, and is ascertained to come from the alimentary canal. Its appearance is doubtless a consequence of the enormous absorption of plant sap by these destructive insects. Many insects show a great liking for the substance; but this appreciation is most highly developed among ants, which in some cases cherish the Aphides as 'milk cows.' (See **ANT**.) Certain coccids also produce honey-dew, that of *Coccus mannifera* being apparently the manna mentioned in Exodus. Certain trees, such as species of Acer (maple, etc.) and Pithecolobium, are particularly liable to the attacks of aphides.

Honey-eaters (Meliphagidae), passerine birds found only in the Australian region and in some of the islands of the Pacific. They have long, slender bills and protrusible tongues, by means of which they extract honey from

Honey-guide

long-tubed flowers. Mingled with the honey are numbers of insects, and it is possible that these are the food chiefly sought. The size rarely exceeds that of the thrush, and the birds occur in wooded country in small flocks. Examples are the parson-bird (*Prosthemadera nova-zealandiae*), very abundant in New Zealand; and the stitch-bird (*Pogonornis cinerea*), in which the male is largely black, with a beautiful band of canary-yellow feathers on the back. It was formerly in great request by the Maoris, who used the plumes in making the feather cloaks of the chiefs.



Honey-guide.

Honey-guide (Indicatoriæ), birds apparently most nearly related to the barbets, but formerly placed with the cuckoos on account of a 'parasitic' habit similar to that displayed by the latter. The honey-guides are sober-coloured birds, rarely exceeding the lark in size, found in Africa, India, and the Malay region. They have the habit of guiding travellers to bees' nests. The circumstantial observations of Sir John Kirk have often been quoted. The object of the birds is apparently to obtain, not honey, but the bee grubs. The eggs are laid in the nests of the allied barbets and woodpeckers, instead of in those of unrelated birds, as in the case of the cuckoo. Examples of honey-guides are *Indicator xanthonotus* of the Himalayas and *I. Sparrmanni* of Africa.

Honey-locust Tree, certain Cape shrubs or trees belonging to the genus *Melanthus*. They are beautiful greenhouse or conservatory plants, with imparipinnate leaves, and are usually very fragrant. In warm districts of Britain they may be grown in the open.

Honeystone, or **MELLITE**, a mineral which crystallizes in the tetragonal system in small, pyramidal, honey-yellow crystals, which have a waxy lustre and a hardness of about 2. It is the aluminium salt of mellitic acid, with water, and is found in coals and bituminous lignites in Bohemia, Moravia, and elsewhere.

Honeysuckle (*Lonicera Periclymenum*), the woodbine of our hedgerows, is a twining, deciduous shrub belonging to the order Caprifoliaceæ. Its delightful fragrance is yielded most strongly at night, for the honeysuckle is fertilized by moths. The flowers are borne in terminal heads, the style with its clubbed stigma and the five stamens protruding beyond the tubular five-cleft corolla. The flowers, which are followed by spherical red fruits or berries, are borne throughout the summer and early autumn, but are most profuse and most fragrant in June and July. French honeysuckle is the popular name of certain hardy perennial leguminous plants belonging to the genus *Hedysarum*, several species of which are valuable for garden decoration.

Honfleur, small harbour and wat.-pl., dep. Calvados, France, on the S. side of the Seine estuary, 8 m. S.E. of Havre. It exports farm produce, and has a thriving fishing industry. Pop. (1901) 9,610.

Hongai, or **PORT COURBET**, bay and port on N.E. coast of Tongking, French Indo-China. The bay, 3 m. long, communicates by a narrow canal with the Bay of Along. Coal is mined.

Hong-kong, isl. off coast of Kwangtung, China, occupied in

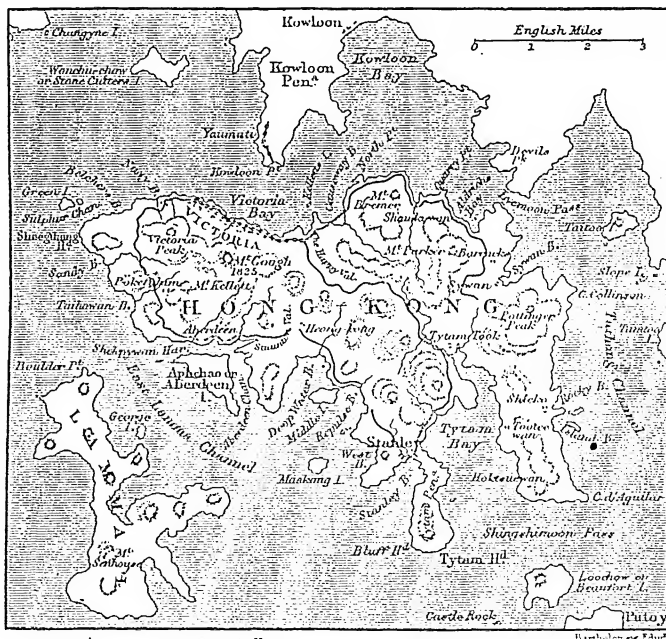
with an area of 30 sq. m.; and consists of a ridge of hills, the highest of which is Victoria Peak (1,823 ft.), broken by narrow val-



Honeysuckle.

1, Part of corolla, with stamens; 2, fruit.

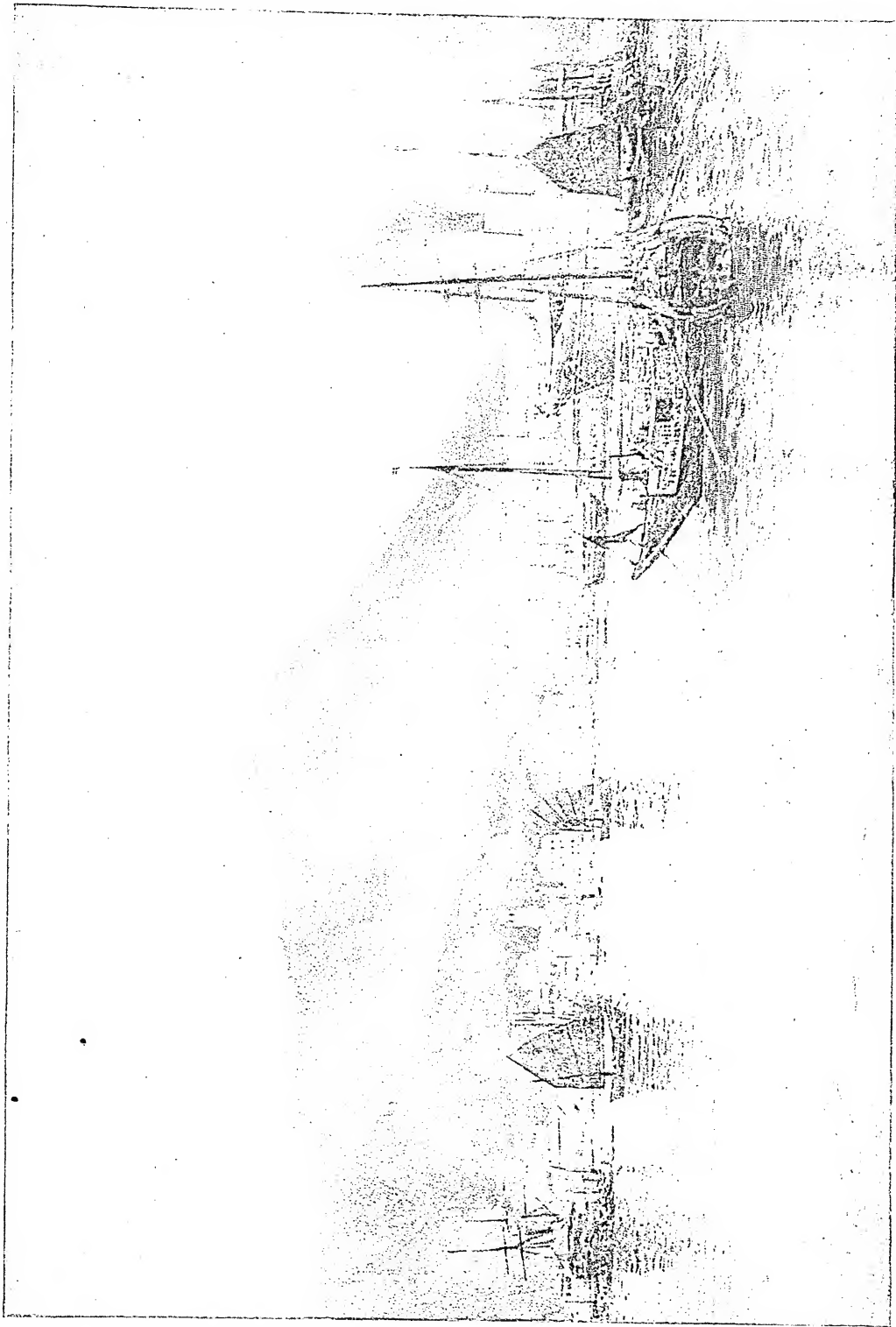
leys. Its possession of a magnificent harbour 10 sq. m. in extent, and its enjoyment of the privileges of a free port under



Hong-kong.

1840 and ceded to Britain in 1842. It lies at the mouth of the Canton R., 90 m. S. of Canton; is about 11 m. long and from 2 to 5 m. wide,

British rule, have made Hong-kong one of the principal ports of the world. Its annual trade is estimated at £20,000,000. It



Victoria, Hong-kong, from the Harbour.
Hong-kong, an island in the China Sea, off the coast of Kwang-tung, China, was ceded to Britain in 1842. The chief town, Victoria, is laid out in streets and terraces at the foot of Victoria Peak (1,823 ft.), and has numerous fine public buildings and picturesque dwellings surrounded with gardens.

has sugar-refining, glass, match, and other factories. Hong-kong is the principal European-Chinese financial centre for S.E. Asia. The colony, which includes the peninsula of Kowloon (ceded in 1860) and about 376 sq. m. of the mainland behind Kowloon (New Territory), leased to Hong-kong by China in 1898 for a term of ninety-nine years, is administered as a crown colony under a governor. On Victoria Peak a large town of fine residences, including a magnificent sanatorium for the European garrison, is rapidly extending. In 1904 the imports into Great Britain from Hong-kong amounted to £466,811; the exports to Hong-kong, £4,574,767—the imports including silk, tea, hemp, and drugs. Pop. (1901) 283,905, to which add the population of the leased territory (about 100,000) and the naval and military forces (13,237). The Chinese, about 375,000 in all, are mostly Cantonese.

Honiton, munic. bor., Devonshire, England, 16 m. N.E. of Exeter. Honiton has been noted for lace-making since the days of Elizabeth. Pop. (1901) 3,271.

Honnef, tn. and health resort in Prussian prov. of Rhineland, on r. bk. of Rhine, at foot of the Siebengebirge, 6 m. S. of Bonn. Pop. (1900) 5,537.

Honolulu, cap. of Hawaiian Is., on S. coast of Oahu, with a deep, safe harbour. The public buildings include the palace, parliament house, Bishop Museum, a theatre, etc. Up to 1815 it was a mere village; five years later it became the capital of the archipelago. Pop. (1900) 39,305.

Honorius (384-423 A.D.), or, in full, Flavius Honorius Augustus, emperor of Rome from 395, was the second son of Theodosius the Great. His reign is noteworthy chiefly for the inroads of the Goths, under Alaric and under Rhadagaisus. The former was checked and the latter defeated by Stilicho, who was the real ruler of the empire during Honorius's youth. But in 408 Stilicho was executed on a charge of conspiracy, and Alaric sacked Rome in 410 A.D. It was in this reign that a systematic persecution of the pagans in the empire began; also that gladiatorial contests were finally abolished. But the reign saw the practical loss to the empire of Spain, Gaul, and Britain.

Honorius I., Pope (626-638), born in Campania; sent the pallium to Paulinus of York and Honorius of Canterbury, and tried unsuccessfully to make the British church adopt the Roman custom of keeping Easter. In a letter to Sergius, patriarch of Constantinople, he expressed opinions favourable to the Mono-

thelites, for which, Pope though he was, he was excommunicated, after his death, at the sixth council of Constantinople (680). See Hefele's *Die Irrlehre des Honorius* (1871).

Honorius II., Pope (1124-30), Lambert of Ostia; sanctioned the order of Knights Templars (1128); sent Otho as missionary to Poland; contended unsuccessfully with Roger, Count of Sicily.

Honorius III., Pope (1216-27), Cencio Savelli, born at Rome; confirmed the order of St. Dominic (1216) and of St. Francis (1223), crowned Frederick II. emperor, opposed the Albigenses, and supported Henry III. of England against France.

Honorius IV., Pope (1285-7), Giacomo Savelli, born at Rome; supported Charles of Anjou against Peter of Aragon, who had taken Sicily and imprisoned the king.

Honour. An honour is a collection of manors under one lord paramount. See MANOR.

Honourable, title given to the younger sons of earls, all children of viscounts and barons, lords of session, the supreme judges of England and Ireland, and maids of honour. Marquises and marchionesses are 'most honourable,' peers and peeresses of lower rank 'right honourable,' as are also privy councillors, younger daughters of dukes and marquises, and younger sons of the same, with their wives.

Honshu. See JAPAN.

Hont, co. of N.W. Hungary, touches the Danube on the S.; is mountainous, and rich in silver, copper, lead, etc. Pigs are bred, and fruit and wine are grown. Area, 1,021 sq. m. Pop. (1900) 130,641. Chief town, Ipolysag.

Hont De, another name for the estuary of the Wester Scheldt in the Netherlands.

Hontheim, JOHANN NIKOLAUS VON (1701-90), German jurist and Roman Catholic priest, was born at Trèves. He became, in 1748, suffragan bishop of Trèves. Under the pseudonym of Justinus Febronius he published, against the usurpations of the popes, his *De Statu Ecclesie et Legitima Potestate Romani Pontificis* (1763).

Honthorst, GERARD VAN (1590-1656), Dutch painter, was born at Utrecht, and studied under Abraham Bloemaert, and also at Rome, where he gained the name of 'Gerardo dalle Notti' from the circumstance of his painting principally night pieces. Charles I. invited him to England, where he was employed in painting Whitehall with allegorical pictures. He was an excellent colourist in the style of Caravaggio.

Honvéd, the old name given to Hungarian national champions, was revived in favour of the in-

surgent patriots in 1848, and again as the title of the national Landwehr and Landsturm under Hungarian autonomy (1868).

Hood, British second-class battleship of 14,150 tons and 15 knots, launched at Chatham 1891.

Hood, a vestment marking university diplomas. See DEGREE.

Hood, ALEXANDER (1758-98). English naval officer, was second cousin of Lords Hood and Bridport; served under Captain James Cook in the *Resolution* from 1772 to 1775. In 1798, in command of the *Mars*, forming part of Bridport's Channel fleet, he was mortally wounded.

Hood, SIR ALEXANDER FULLER ACLAND (1853), fourth baronet, was born at Bridgwater. He entered the army, and served in the Egyptian campaign of 1882. In 1892 he retired, and entered Parliament as member for W. Somerset (1892-1906). He was parliamentary secretary to the Treasury from 1902 to 1906. In 1900 he was appointed vice-chamberlain of H.M. household.

Hood, ARTHUR WILLIAM (1824-1901), English admiral, first Baron Hood of Avalon, rendered assistance to the naval brigade before Sebastopol, and in 1856 served with the naval brigade at the capture of Canton. From 1876 to 1879 he was second lord of the Admiralty, and from 1885 to 1889 first lord.

Hood, BASIL (1864), English dramatic author, has written a large number of dramatic pieces, chiefly librettos, among them *The Gypsies*, *Donna Luiza*, *Her Royal Highness*, *The Emerald Isle*, *The Crossing-Sweeper*, *Auld Lang Syne*, *The Rose of Persia*, *Merric England*, *Sweet and Twenty*, *My Pretty Maid*, *A Princess of Kensington*, and a dramatic version of Hans Andersen's *Tales*.

Hood, JOHN BELL (1831-79), American soldier, born at Owen-ville, Kentucky. He joined the Confederacy (1861), and served gallantly in the Virginia campaigns (1862-3). He succeeded to J. E. Johnston's command, and was forced from Atlanta by Sherman (1864). See his *Advance and Retreat*, *Personal Experiences in the United States and Confederate Armies* (1880).

Hood, ROBIN. See ROBIN HOOD.

Hood, SIR SAMUEL, VISCOUNT HOOD (1724-1816), English admiral, elder brother of Lord Bridport, took part in Anson's action off Cape Finisterre (1747), and in the action off Louisburg (1756). In the following year he attacked and drove on shore the French ship *Aquilon*, and in 1759 captured the *Bellona*. As rear-admiral (1780) he displayed great ability in the action off Martinique (1781). Later in the same

year he was second in command in the action off the Chesapeake, and in the year following repulsed De Grasse at St. Kitts; and later, serving as second under Rodney, took part in the total defeat of the French fleet off Dominica. In 1788 he became a lord of the Admiralty, and in 1793 gained possession of Toulon, and of the French fleet which lay in port, and effected the reduction of Corsica. In 1794 he reached the rank of admiral, and in 1796 was appointed governor of Greenwich Hospital. In the latter year he was also created a viscount of Great Britain. Many of his professional papers were printed (ed. by Almon and others) in 1895 by the Navy Records Society.

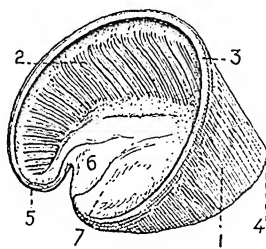
Hood, Sir Samuel (1762-1814), English naval officer, commanded the *Renard* in the action off Dominica (1782). In 1793 he gained much celebrity by his clever escape from the port of Toulon, which he had entered, believing it to be in British hands. He was soon afterwards employed in the reduction of Corsica, and in 1797 commanded the *Zealous* at the attack on Santa Cruz, and at the battle of the Nile (1798). In 1799 he assisted in expelling the French from Naples. In the *Venerable* he shared in Saumarez's two actions in 1801; and in the *Centaur* he won a K.B. by capturing Demerara, Essequibo, Surinam, and Berbice. In 1805 he captured four heavy frigates off Rochefort, in a hot action which cost him the loss of an arm. In 1807 he was with Gambier in the attack upon Copenhagen, and at the end of the same year took possession of Madeira. One of his famous exploits was effected in 1808, when he destroyed the Russian *Sevoolod* in the Baltic.

Hood, Thomas (1799-1845), English poet, was born in the Poultry, London. In 1821 he became sub-editor of the *London Magazine*; to it he contributed verse, and through it he became the friend of Lamb. In 1825 he published, in conjunction with Reynolds, *Odes and Addresses to Great People*. *Whims and Oddities* (1826) was entirely his own. In 1830 appeared his first *Comic Annual*. In 1832 he occupied the Lake House at Wanstead, the scene of his novel *Tydney Hall* (1834). In 1835-40, through pressure of debt, he lived abroad, and published *Up the Rhine* (1839). Returning to England in 1840, he became for a short time editor of Colburn's *New Monthly*. He renewed his *Comic Annual*; wrote (1843) *The Song of the Shirt* for *Punch*, and (1844) *The Bridge of Sighs* in a magazine of his own, and the fine imaginative poetry of *Lycus the Centaur*, *The Dream of the Midsummer Fairies*, and *Hero*

and *Leander*. His wit and humour were more lucrative to this brave struggler than the qualities with which they were inseparably blended. In him 'the strings attuned to mirth had their chords in melancholy,' and his quaintest extravagances cover a fine moral sincerity. His *Miss Kilmansegg* is rightly classed among his serious poems; and with the pathos of *The Song of the Shirt* and *The Bridge of Sighs* he stirred all hearts. His life has been written by his son and daughter, but the most discriminating account of him is that by Canon Ainger, prefixed to his edition of the poems (1897).

Hood, Mount, summit in the Cascade range of Oregon, U.S.A.; is an extinct volcano, standing just S. of Columbia R., and rising to 11,225 ft. above the sea. Its summit is glaciated.

Hoofed Mammals. See **UNGULATA**.



Hoof.

1. Horny wall or crust (hoof horn). 2. Inner layer of non-fibrous horn (insensitive) laminae. 3. Coronal band (peripol). 4. The toe. 5. The heel. 6. The frog. 7. The bars.

Hoofs are the solid envelopes which, in the majority of ungulates, encase the extremities of the digits, and replace the nails or claws of other mammals. They are insensitive, and form a strong surface on which the weight of the animal is supported, so that functionally they are to be regarded as an adaptation to the digitigrade position. Like nails, they are renewed behind as they are gradually worn away in front. In the horse the hoof is singularly broad and solid.

Hooft, Pieter Corneliszoon (1581-1647), Dutch poet and historian, son of a burgomaster of Amsterdam. He became mayor of Muiden, where he gathered round him a literary circle (Vondel, Huygens). He laboured to perfect his mother tongue, especially in erotic poems (*Minne-dichten*; new ed. 1902), and in tragedies (*Bacchus and Geerardt van Velzen*), and the comedy *Warener* (1615). In prose he wrote chiefly history, as the valuable *Nederlandsche Historien* (1642); *Henrik de Groote (IV., zijn Leven)* (1626), etc. There is a *Life*, in Dutch, by G. Brandt (1671; new ed. 1874).

Hoogeveen, tn., Dutch prov. of Drenthe, 32 m. by rail S. of Groningen. Pop. (1899) 11,924.

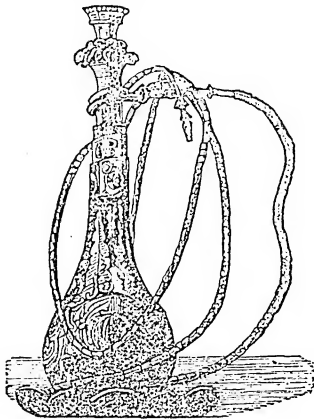
Hoogly. See **HUGLI**.

Hook, James Clark (1819-1901), English painter, born in London. A gold medallist of the Academy schools, he won the travelling studentship in 1846, and worked in Italy with his wife, also an artist. He was elected A.R.A. (1851), and R.A. (1860). The Tate Gallery has four of his pictures. His favourite scenes are Cornish pastoral landscapes, and idylls of the sea viewed in relation to human life. He painted with strong, breezy touch and full, rich colour.

Hook, Theodore Edward (1788-1841), English wit, dramatist, novelist, and journalist, was born in London. He began by writing farces and dramas for Matthews, Liston, and Bannister—his principal effort being *Paul Pry*, associated with the fame of Liston and Toole. He carried his powers of 'improvisation' to excess, and he frequently got into trouble from his fits of spontaneous humour. In 1813 he was made accountant-general and treasurer in the Mauritius, but he had to resign it (1817) owing to the defalcations of a clerk, and thereafter edited *John Bull* (1820), which achieved great success, only exceeded by the popularity of his three series of *Sayings and Doings* (1824-8). This was followed by *Maxwell* (1830), *Life of Sir David Baird* (1832), with *Gilbert Gurney* (1836) and *Gurney Married* (1838) in the pages of *The New Monthly*, of which he became editor in 1836. In the same paper appeared *Jack Brag* (1837), and *Births, Deaths, and Marriages* (1839). Hook was to the upper and middle life of society what Dickens was to its low life—a true, authentic expositor. See *Life and Remains of Hook*, edited by R. H. Barham (1849; new ed. 1899).

Hook, Walter Farquhar (1798-1875), English ecclesiastical historian, nephew of Theodore Hook, was born in London. He became vicar of Leeds (1837), and dean of Chichester (1859). A high churchman and friend to the Tractarian movement, Hook's sermon 'Hear the Church,' preached before the queen, and his vigorous pastorate at Leeds, did much to arouse the Anglican spirit. Among his works are *An Ecclesiastical Biography* (8 vols. 1845-52), *A Church Dictionary* (1842; 14th ed. 1887), *The Church and its Ordinances* (1876), and *Lives of the Archbishops of Canterbury* (12 vols. 1860-76). See *Stephens's Life and Letters of Dean Hook* (1878).

Hookah, the *narghileh* of India and Persia, an Oriental tobacco pipe, having the bowl attached to a vase containing water, through which the smoke passes before entering a long flexible tube conveying it to the mouthpiece.



Hookah, or Narghileh.

Hooke, ROBERT (1635-1703), English experimental philosopher, born at Freshwater, Isle of Wight. Among his numerous inventions were the first screw-divided quadrant, an anemometer, a weather-clock, the anchor escapement of clocks, and a universal joint. He was the first to apply the spring-balance wheel to watches. He designed the new Bethlehem Hospital, Montague House, and the College of Physicians in London. He divined before Newton the true doctrine of universal gravitation, but from his lack of mathematical knowledge failed to demonstrate his discovery.

Hooker, MOUNT, peak of the Rocky Mts., S.E. of Mt. Brown, on the boundary between British Columbia and Alberta, Canada, in 52° 13' N. Its reputed altitude is 15,690 ft.

Hooker, JOSEPH (1814-79), American soldier, born at Old Hadley, Massachusetts; served in Mexico (1846-8). In the civil war he led his division at Fair Oaks, Malvern Hill, Charles City Cross, and through the North Virginian campaign (August 1862) and Maryland campaign (September 1862), being pitted against 'Stonewall' Jackson at Antietam, and commanding the centre at Fredericksburg. Hooker led the army of the Potomac, January to June 1863, losing Chancellorsville through failure of his right wing. In the Atlanta campaign his 20th corps was conspicuous at Wauhatchie, Lookout Mountain, and the siege of Atlanta. He died at Garden City, New York.

Hooker, SIR JOSEPH DALTON (1817), English naturalist and traveller, born at Halesworth, Suffolk; accompanied Sir James C. Ross in the English Antarctic expedition of 1839-43 as assistant surgeon, but really as botanist. After that he made an expedition to India and the Himalayas (1847), and travelled in Syria (1860) and Morocco (1871). He then became assistant director at Kew Gardens (1855), and director (1865-85), being the intimate friend of Darwin, Huxley, and others; Copley medallist (1887). He is author of *Botany of the Antarctic Voyage* (1844-60); *Himalayan Journal* (1854; new ed. 1905); *Genera Plantarum* (1862); *Morocco and the Great Atlas*, with Ball (1878); *Flora of British India* (1875-97); *Student's Flora of the British Islands*.

Hooker, RICHARD (1551-1600), English theologian, was born at Heavitree, Devonshire. He held for a time the Hebrew lectureship at Oxford, but left for the living of Drayton-Beauchamp in Buckinghamshire. In 1585 he was made master of the Temple. Out of the disputes which there beset him grew the *Ecclesiastical Polity*, which he finished as far as the fourth book at Boscombe, Wiltshire, to which living he was presented in 1591; thence, in 1595, he passed to the rectory of Bishopsbourne, Kent. The fifth book of the *Polity* appeared in 1597. Both in character and in genius Hooker towers above all the ecclesiastics of his age. In him there was combined an impartiality, which won him the epithet 'judicious,' with a character at once studious, simple, and humble. He defended episcopacy as of primitive antiquity and practical value. In the *Ecclesiastical Polity* he rises to a stately and solemn dignity of style which places him among the earliest masters of English prose. See *Lives* by Gauden (1662) and Izaak Walton (1665). The best edition of the *Ecclesiastical Polity* is that by Keble (containing a preface by him, and the *Life* by Walton), revised by Church and Paget in 1888.

Hooker, THOMAS (c. 1586-1647), pioneer of Connecticut, born at Markfield, Leicestershire, England; became (1626) a minister at Chelmsford. His Puritan tenets having caused him to be arraigned by the ecclesiastical courts, he withdrew to Holland, and sailed for New England (1633). Chosen pastor of Newtowne in Massachusetts, he led his people to Connecticut, and founded Hartford (June 1636). See 'Life of Thomas Hooker,' by E. W. Hooker, in *Chief Fathers of New England* (1849); and Walker's *History of the First Church of Hartford, Connecticut* (1883).

Hooker, SIR WILLIAM JACKSON (1785-1865), English botanist, born at Norwich, Norfolk. After visiting Iceland (1809), his *Recollections of Iceland*, 4 vols., were published (1813). He was elected professor of botany, University of Glasgow (1820-40), and formed a grand herbarium. He published *Flora Scotica* (1821), and was appointed director of the Royal Botanic Gardens, Kew (1841), where he spent the rest of his life. He wrote *Exotic Flora* (1823-7), *Icones Filicum* (1829-31), *Icones Plantarum* (1837-54), *Species Filicum* (1846-64), *Filices Exotice* (1857-9), etc. An account of his life was written (1902) by Sir Joseph D. Hooker for the *Annals of Botany*.

Hook of Holland, or HOEK-VAN-HOLLAND, the point of a small peninsula of S. Holland, at mouth of the New Waterway, 17 m. W.N.W. of Rotterdam.

Hooks and Eyes, dress fasteners, made of wire, in brass or white metal, left uncoloured, or japanned and lacquered. Small hooks of thin wire are 'dress hooks,' a larger variety are 'mantle hooks.' 'Safety hooks' consist of a narrow band of bent steel which closes automatically.

Hoole, JOHN (1727-1803), English author and translator, born in London; was for many years in the India House, where he rose to be auditor of accounts. He published translations of Tasso's *Jerusalem Delivered* (1763), of Ariosto's *Orlando Furioso* (1773), and of Metastasio's *Dramas* (1767). *Anecdotes of his Life* were published (1804). See *Life* by his son, W. Hoole (1805).

Hooper, JOHN (?1495-1555), English divine, born in Somerset; in 1518 became a Cistercian monk at Gloucester. A study of Zwingli's writings made him a Protestant. He was made bishop of Gloucester by Edward VI. (1550), but had scruples as to wearing the vestments of his order. On the accession of Mary he was put into the Fleet prison, and was burned at the stake in Gloucester. See *Early Writings*, ed. by Carr (1843); *Later Writings*, ed. by Nevinson (1852).

Hooping-cough, WHOOPING-COUGH, or PERTUSSIS, is an epidemic disease, highly contagious, and also somewhat infectious. It is practically certain that whooping-cough is due to a specific germ, though it is not certain that the organism has yet been isolated. The disease is characterized by violent fits of coughing, generally accompanied by a peculiar loud whoop or crowing inspiration. The period of incubation lasts about ten days, after which the usual signs of ordinary influenza could set in, with some running at the eyes and nose, a slight rise of

temperature, and general discomfort. A fortnight later whooping generally commences, and the ordinary attack continues for about six weeks, but in many cases a much longer period elapses before recovery. The whooping, which is caused by a spasm of the larynx, is accompanied by great distress, resulting in much exhaustion, which in children is increased by their fright. If the attack be severe, it often ends in vomiting, and hence further exhaustion. Children are far more liable than adults to the infection, and even children at the breast may contract the disease. One attack generally, though not always, protects. Adults and old people may be infected, and in the aged it is a very serious trouble, on account of the exhaustion it produces. There may be only two or three attacks during the day, or they may occur every half-hour or so for a time. After whooping-cough a child should be isolated for a fortnight after he has last coughed, not after he has last whooped. Whooping-cough is very fatal to young children, particularly among the poorer classes. Serious and not very uncommon complications are broncho-pneumonia, pleurisy, hemorrhage of the lungs or elsewhere, convulsions, great wasting, collapse of the lung or the opposite condition, emphysema.

Treatment.—When a child is attacked, while keeping it out of draughts and thoroughly warm, let it not suffer in a stuffy room. If the attack be light, keep the child as much as possible in the open air every day, taking care that isolation is observed. It has lately been claimed that attacks are much shortened if the child, while indoors, inhabits a room the air of which is saturated with creosote by hanging up clothes soaked in that antiseptic. Others advocate syringing the nostrils with carbolic-acid solution. In both cases the idea is to disinfect the nose and respiratory tract. Belladonna and bromides as sedatives, also antipyrin and paregoric, are much used. The tough sputum is loosened sometimes by small doses of ipecacuanha. At other times, to relieve severe spasms, an emetic dose of the same drug is serviceable. The writer has found steaming the throat with boiling water and eucalyptus oil of great assistance in bringing up the plugs of mucus.

Hoopoes are birds related to the hornbills, and constituting the family Upupidae. The true hoopoes belong to the genus *Upupa*, and are graceful birds, found in Europe, Asia, and Africa. All have a long bill, by means

of which they obtain the worms and insects on which they feed. The name is derived from the peculiar cry. The hen hardly



Hoopoe.

stirs from the nest during incubation, and is fed by the cock. The oil-gland during the period of incubation produces a secretion of evil odour, and the nest is lined with dung, or even placed among carrion. An example is *Upupa epops*, which has a fine crest, and frequently visits Britain. The related wood hoopoes (genera *Irisor*, *Scoptelus*, *Rhinopomastus*) differ from the typical forms, especially in the shape of the wings and tail.

Hoopstad, div. and tn., Orange River Colony, British S. Africa, N.E. of Kimberley, and 65 m. from Brandfort on the Vet R.

Hoorn, tn. and seapt., Netherlands, prov. N. Holland, at w. side of Zuider Zee, 25 m. by rail N. of Amsterdam. It is famous for its cheese and cattle markets. Off the town the Spaniards were defeated by the Dutch in 1573. Hoorn is the birthplace of the navigator Schouten (1580). It has saw-milling and shipbuilding. Pop. (1899) 10,714.

Hoosac Mountains, part of the Green Mts., Massachusetts, U.S.A.

Hoosick Falls, vil. of Rensselaer co., New York, U.S.A., 24 m. N.E. of Troy; has manufactures of reaping and mowing machines. Pop. (1900) 5,671.

Hope, ALEXANDER JAMES BERSFORD (1820-87), English politician and author, entered Parliament (1841) as an independent Conservative, and was twice member for Maidstone; also represented Stoke-on-Trent (1865), and Cambridge University from 1868 until his death. He founded a college for missionary clergy (1844) at Canterbury, and built and endowed All Saints, Margaret Street, London. He is the author of numerous political pamphlets, and of three novels (e.g. *Strictly Tied Up*).

Hope, ANTHONY, pseudonym of ANTHONY HOPE HAWKINS (1863), English novelist, was born in London. He published *A Man of Mark* in 1890, and in 1894 his two great successes, *The Prisoner of Zenda* and *The Dolly Dialogues*, examples of widely different styles. His subsequent works have been *The God in the Car* (1894); *The Chronicles of Count Antonio* (1895); *Comedies of Courtship*; *The Heart of Princess Osra* (1896); *Phroso* (1897); *Simon Dale*; *Rupert of Hentzau* (1898); *The King's Mirror* (1899); *Quisante* (1900); *Tristram of Blent* (1901); *The Intrusions of Peggy* (1902); *Double Harness* (1904); and *A Servant of the Public* (1905). *The Prisoner of Zenda* has been successfully dramatized, and Mr. Hope produced *The Adventure of Lady Ursula* at the Duke of York's Theatre (1898).

Hope, SIR JAMES (1808-81), British admiral, when in command of the *Firebrand*, opened the passage of the Parana, in the river Plate, by cutting the chain at Obligado (1845). He was commander-in-chief in China, was wounded in the attack on the Peiho forts in 1859, and brought about the capture of Peking. He was wounded in the Taeping rebellion (1862).

Hope, THOMAS (?1770-1831), author and connoisseur, eldest son of John Hope, a rich Amsterdammer merchant; settled in England (1796), and collected vases, sculptures, pictures, and works of art (dispersed at Christie's, 1894). He was the author of handsome books on *Household Furniture* (1807), *Costume of the Ancients* (1809), *Designs of Modern Costume* (1812), *Historical Essay on Architecture* (1835), and a romance, *Anastasius* (1819).

Hopetfield, sub-district of the Malmesbury division of Cape Colony, 40 m. N.W. of Malmesbury.

Hope-Scott, JAMES ROBERT (1812-73), English parliamentary barrister, grandson of the second Earl of Hopetoun; born at Great Marlow in Berkshire. Called to the bar (1840), he soon became a skilful and tactful pleader, and was made Q.C. in 1849. He was an associate of Gladstone, Manning, and Newman, and joined the Church of Rome in 1851. He was married to a granddaughter of Sir Walter Scott, and changed his name to Scott. See R. Ormsby's *Memoirs of J. R. Hope-Scott* (1884).

Hopetoun, EARL OF. See LINTHGO, MARQUIS OF.

Hopetoun, JOHN HOPE, FOURTH EARL OF (1765-1823), British general, was born at Hopetoun House, Linlithgowshire. He served in W. Indies (1796), Holland (1799), Egypt, where he was wounded

Hopetown

(1801), Corunna (1809), Walcheren expedition (1809), and in the Peninsular campaign, when he was again wounded and taken prisoner in the final sortie from Bayonne (1813).

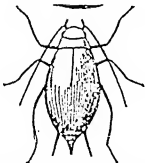
Hopetown, div. of Cape Colony (pop. 6,500), and tn. (pop. 250), close to Orange R., and s. of Kimberley.



Hop-flea.

Hop-flea, or **TOOTH-LEGGED BEETLE** (*Phyllotreta concinna*), a member of the Chrysomelidae, a very destructive family of plant-eating beetles. The beetles of this genus have greatly-developed posterior legs, and are popularly known as 'hoppers.' The hop-flea damages the hop plants exactly after the same fashion as the turnip-flea does the turnips, by feeding upon the first green shoots when they appear in spring.

Hop-fly, a species of *Aphis* (*Aphis Humuli*) which in certain seasons works fearful havoc in the hop fields. The species differs in no important point from other aphids. See *APHIS*.



Hop-fly—imago and larva.

Hôpital, MICHEL DE L'. See *L'HÔPITAL*.

Hopkins, EDWARD JOHN (1818-1901), English organist and author. Beginning as a boy chorister at the Chapel Royal (1826), he became organist of the Temple Church from 1843 to 1897. Here he loyally upheld church music of the finest English school. He wrote *The Organ, its History and Construction* (1855; 3rd ed. 1877), edited *Madrigals* by Benet and Weelkes for the Musical Antiquarian Society, and composed church music.

Hopkins, JOHN (d. 1570), English hymn-writer, is noted for his share in the poetical version of the Psalms of David by Sternhold and Hopkins, of which the British Museum possesses more than six hundred editions published between 1549 and 1823. The Old Hundredth is attributed to him. Hopkins became rector of Great Waldingfield, Suffolk, in 1561.

Hopkins, SIR JOHN OMMANEY (1834), English admiral, served during the Crimean war before Sebastopol (1854-5). He was director of naval ordnance (1883), and was admiral-superintendent of Portsmouth dockyard (1895-8), naval lord of the Admiralty and controller of the navy (1888-92), and commander-in-chief of the Mediterranean station (1896-9). He attained the rank of admiral in 1896, and retired (1897).

Hopkins, JOHNS (1795-1873), American philanthropist, born in Anne Arundel co., Maryland; led an uneventful life as a grocer in Baltimore, and amassed a large fortune, with which he bought a public park for the people of Baltimore (1873), and founded a university named after himself (opened 1876), one of the principal seats of learning in the United States. See *JOHNS HOPKINS UNIVERSITY*.

Hopkins, MARK (1802-87), American educationist, was born at Stockbridge, Massachusetts. In 1830 he was appointed professor of moral philosophy in Williams College, of which he became president in 1836—a position he held till 1872. He was also pastor of the college church (1836-83). Among his works are *Lectures on the Evidences of Christianity* (1846), *Miscellaneous Essays* (1847), *Lectures on Moral Science* (1862), *Outline Study of Man* (1873), and *Teachings and Counsels* (1884).

Hopkins, MATTHEW (?1596-1647), 'witch-finder-general.' During an epidemic of witchcraft he explored the eastern counties in pursuit of those suspected of the crime, subjecting them to the ordeal by swimming or sinking—an ordeal to which he was eventually and effectually himself subjected. In 1647 he published his *Discovery of Witches*. See Dr. Hutchinson's *Historical Essay on Witchcraft* (1720), and Sir Walter Scott's *Letters on Demonology* (Morley's ed. 1884); also article *WITCHCRAFT*.

Hopkins, SAMUEL (1721-1803), American theologian, was born at Waterbury, Connecticut; studied divinity under Jonathan Edwards. From 1743-69 he was pastor of the church at Housatonic, and from 1770-9 minister of Newport, Rhode I. Hopkins was a strenuous opponent of slavery,

which he inveighed against in his *Dialogue against Slavery* (1776). He was noted as the founder of 'Hopkinsian divinity,' a modification of Calvinism, and a fuller development of the theology of Jonathan Edwards, which he expounded in his *System of Doctrines* (1793). See *Autobiography* (1895) and *Memoirs* by S. A. Park, with Life (1832). Dr. Hopkins is the original of one of the principal characters of Mrs. Beecher Stowe's *The Minister's Wife*.

Hopkins, WILLIAM (1792-1866), English mathematician and geologist, born at Kingstons, Derbyshire. His success in preparing mathematical pupils at Cambridge gained him the name of 'the senior wrangler-maker;' and in 1849 'he was able to say that he had had among his pupils nearly two hundred wranglers, of whom seventeen had been senior and forty-four in one of the first three places.' Some of these have since become distinguished—e.g. Professor Stokes, Sir W. Thomson (Lord Kelvin), Tait, Fawcett, Clerk Maxwell, and Todhunter. Acquiring a taste for geology from Professor Sedgwick, Hopkins became well known to scientists by the application of mathematical methods to certain physical theories. He gained the Wollaston medal (1850) for these researches. He was the author of *Elements of Trigonometry* (1833) and *Theoretical Investigations on Motions of Glaciers* (1842).

Hopkinson, JOHN (1846-88), English electrical engineer, was born in Manchester; he was senior wrangler at Cambridge. From 1872 to 1878 he was employed in designing and manufacturing the optical parts of lighthouses. The chief feature which he originated in lighthouse practice was the group-flash system. In 1876 he set up as a consulting engineer in London, and in 1880 became head of the Siemens Laboratory at King's College, London. He wrote a large number of scientific papers in connection with electricity and magnetism, dynamos, etc. His death was due to an Alpine accident. See *Original Papers*, with Memoir (2 vols. 1901).

Hopkinson, JOSEPH (1770-1842), American jurist, born at Philadelphia, and was counsel for Benjamin Rush (1793) against Cobbett, and for Judge Samuel Chase (1800), when impeached before the Senate. He became a member of Congress (1813), and in 1828 was appointed one of the judges for Pennsylvania. He was author of *Hail, Columbia* (1798).

Hopkinsville, city, Kentucky, U.S.A., co. seat of Christian co., 70 m. N.W. of Nashville. Tobacco is the chief industry. Pop. (1900) 7,230.

Hoppner, JOHN (1758-1810), English portrait painter, born in Whitechapel, London. At the Royal Academy schools he won the gold medal in 1782. His portraits of the three princesses, Sophia, Amelia, and Mary, were executed in 1783, and some years later he was appointed portrait painter to the prince regent, thus becoming the recognized painter of the Whig beauties and distinguished men of his day. In 1793 he was elected associate, and in 1795 full member, of the Royal Academy. He modelled his style and composition upon Reynolds; his figures being graceful, at times austere, his colouring brilliant but mellow, and his handling free. His best work has been done in painting women and children, and good examples of these may be seen in *The Countess of Oxford* (National Gallery), *Mrs. Jordan* (Hampton Court), and *Miss Mary Linwood* (S. Kensington). The *Marquis of Lansdowne*, *Lord Grenville*, *William Pitt*, and other male portraits are in the National Portrait Gallery.

Hops belong to the same natural order (Urticaceae) as hemp and the common nettle. It, like most of the order, is dioecious—the male or barren plant flowering in perianths of five leaves, while the female or fertile flower (hop) is a catkin compounded of large concave scales, each of which has at its base two styles and one seed. The hop constitutes the genus *Humulus*, and is specifically described as *Humulus lupulus*. It is a beautiful climbing plant, cultivated for the sake of the catkins, which contain a bitter principle (lupulin), and are used in brewing for imparting an agreeable flavour to beer. The wild hop is a common and generally distributed hedgerow plant, but the cultivated hop has developed a very large number of varieties adapted for different soils. Goldings rank among the finest Kent hops, and are equal to the best Bavarian (Spalt) or Bohemian (Saaz) hops. Colegates, grapes, and Jones's are coarser and ranker in flavour, and are grown on the Weald of Sussex. In Worcestershire and Herefordshire white malthons, Cooper's whites, and Mayfield grapes are principally grown, as well as goldings. In Surrey and Hants, William's whitebines, greenbines, and golding clusters, bramblings, early goldings, and prolifics are cultivated.

Hops require deep cultivation and very liberal manuring. The duration of the plant varies from fifteen or twenty years to an indefinite length of time, some of the finest gardens having been in existence for over a hundred years. In such cases a percentage of the

stocks die and are replaced every season. No crop is more affected by the weather, nor more subject to destruction from blight or attacks of aphids and other insects. The profits, on the other hand, in some cases have amounted to £100 per acre, and the average profit of hop lands has been estimated at about £10 per acre. Before planting, the ground should be trench-dug or deeply subsoil-ploughed. The hills are set 6 ft. 6 in. each way, which gives 1,030 stocks per acre, but in some cases 1,200 or even 1,400 are planted. The old hop-pole has been sup-



Hop (Humulus lupulus).

1, Female inflorescence; 2, male inflorescence; 3, male flower; 4, female; 5, fruit, with scale; 6, fruit (seed); 7, section.

planted by horizontal wires and stays which carry the bine overhead. Manuring consists in applying dressings of from fifteen to twenty tons of farmyard manure, with additions of nitrogenous materials such as shoddy, rape-cake, woollen rags, sheep-trotters, etc., all of which are applied in the winter. Lighter manures—such as guano, nitrate of soda, and superphosphate—are dug in around the hills in the spring, so that the total cost of manure often amounts to £13 per acre. Hop-picking employs thousands of immigrants, 99,670 having been en-

gaged in one season in Kent alone. The hops as gathered are carried to the kilns, dried, and sulphured. The oast-house is generally built with several kilns in a group. The heaviest crops are about one ton per acre, while the average produce is about 6½ cwt. The average price may be placed at £7 per cwt. The highest price on record was £27 per cwt. in 1817, and the lowest was £2, 15s. in 1848. In 1904, 47,799 acres were planted with hops in England, and in 1904 the total yield amounted to 421,068 cwt.

Hopsonn, SIR THOMAS (1642-1717), English vice-admiral, born at Bonechurch, Isle of Wight; was at the battle of Sole Bay (1672); commanded the *York* in Torrington's fleet, and took part in the battle of Beachy Head (1690). Two years later, under Russell, he was in command of the *St. Michael* at the battle of Barfleur. At the battle of Vigo Bay, in 1702, he led the attack in the *Torrey*, and broke the boom.

Hop Substitutes are bitter principles like quassia, camomile, or even more objectionable substances, that are used in the preparation, or rather sophistication, of beer as a substitute for hops.

Hor (mod. Jebel Harun = 'Aaron's Mount'), mt. of Arabia, on the border of the land of Edom (Num. 20:23), between the Dead Sea and the Gulf of Akabah. It is the reputed scene of Aaron's death, and the structure on the summit is said to mark his tomb.

Horace (65-8 B.C.), Roman poet, whose full name was Quintus Horatius Flaccus, was born near Venusia in Apulia. He was not by race of Roman blood, but was educated at Rome and at Athens. In 44 B.C., when Brutus visited Athens after the murder of Cæsar, Horace joined him as military tribune, and took part in the decisive battle of Philippi (42 B.C.). He soon afterwards returned to Rome, and secured a place as clerk in the quaestor's office. Erelong Virgil and Varius brought him to the notice of Mæcenæ (38 or 37 B.C.), who presented him with an estate in the Sabine country, on which Horace lived much in after years. Through Mæcenæ he enjoyed the best society of the time, including that of Augustus. Having bought or hired a small house at Tibur, between that place, his Sabine farm, and Rome he spent the rest of his days. His writings include four books of *Odes*, lyrical poems on a variety of subjects; one book of *Epodes*—iambics he calls them himself, i.e. lampoons of a bitter and sometimes coarse description; two books of *Satires*, which, on the whole, are not violent or severe, but rather caustic and witty sketches of the character and

manners of the times; two books of *Epistles*, which are similar to the *Satires*, but wider in their choice of subjects, and even more good-humoured in their tone; and the *Ars Poetica*, a letter to a young friend, dissuading him from attempting poetry, while giving advice on the subject. For the varying theories as to the precise dates of publication of his works any of the authorities mentioned below may be consulted. As a lyric poet he charms us more by the unsurpassable perfection of his language and his absolute command of metrical expression than by the fervour, the passion, and the inspiration that infuse the greatest lyrical poetry. His love poems are scarcely more than graceful society verses; his reflections on life, death, and such graver subjects are mostly commonplace; and it is chiefly in his celebrations of Roman conquests and character that we find in him a genuine feeling and force, though in his many pleasing descriptions of nature also there is much real poetry. There is also another charm, which even more conspicuously recommends the *Satires* and *Epistles* to readers, and that is the candour of the poet's self-revelation. He shows himself genial, courteous, considerate, compassionate of error, while severe against dishonesty of every sort, and of a genuine independence of mind; and his insight into the essentials of human nature was such that even to-day no poetry applies so readily to all sorts of social circumstances as that of Horace. He is the poet of the man of the world in the better sense of that phrase, and many a Horatian phrase has become proverbial. Editions: Nauck (1894-1900), Wickham (1901), Palmer (*Satires*, 1883), Wilkins (*Epistles*, 1885). Translations: Theodore Martin (1881), Conington (1863-70), Lord Lytton (1872), F. W. Newman (*Odes* only, 1876), and Wickham (1903). Other works to be consulted are Poiret's *Horace* (1890), Sellar's *Horace and the Elegiac Poets* (1899), Nettleship's *Lectures and Essays* (1885), and Dean Milman's *Life*, prefixed to Horace's works (1868).

Horæ (i.e. the Seasons), in ancient Greek mythology, were daughters of Zeus and Themis, goddesses who regulated the order of nature, guarded the doors of heaven, and promoted the fertility of the earth by their control of the weather. Their number is usually given as three or four. They are represented in art as maidens in the bloom of youth.

Horatii, three brothers of the Horatian clan in ancient Rome, who fought with three Curiatii from Alba to decide whether

Rome or Alba should rule the Latin league. One of Corneille's great tragedies, *Horace*, deals with this subject.

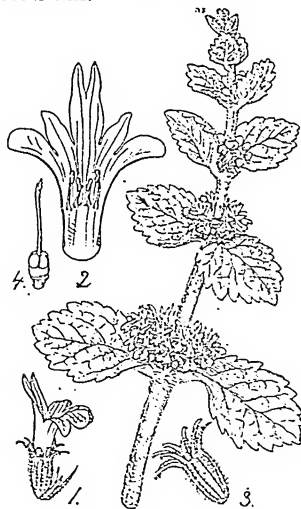
Horatius Cocles, on the occasion of Porsena's attack on Rome, about 508 B.C., is said to have held (with two others) the Sublician bridge against the whole Etruscan army, while the bridge was being broken down. He then sprang into the Tiber, and swam ashore. The story forms the subject of one of Macaulay's *Lays of Ancient Rome*.

Horbury, tn., 3 m. s.w. of Wakefield, W. Yorkshire, England. Manufactures woollen cloths, worsted, and yarns, and has iron works, railway-wagon works, and stone quarries. Pop. (1901) 6,736.

Hörde, tn., Prussian prov. of Westphalia, 3 m. by rail s.e. of Dortmund, with iron and steel works, and coal and iron mines. Pop. (1900) 25,126.

Hordein, the name given by Proust to a pulverulent mixture of starch, cellulose, and proteid matter, left as a residue when barley meal is digested with acidulated water. It was at first believed to be a definite chemical compound.

Horeb, MOUNT, in the Old Testament an alternative name of Mount Sinai. Detailed investigation reveals that Sinai is used by P and J, Horeb by E and D (see *HEXATEUCH*); in Deuteronomy—the reduplication of the law—the mount of revelation is always Horeb, not Sinai, as in Exodus. See *SINAI*.



Horehound.

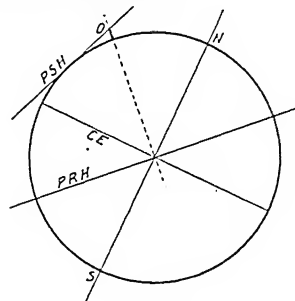
1. Flower; 2. corolla, laid open; 3. calyx; 4. pistil.

Horehound, a term applied to two British labiate plants belonging to different genera,

White horehound (*Marrubium vulgare*) is the aromatic, bitter herb highly reputed in domestic medicine. It has down-covered stems and leaves, the latter being deeply wrinkled. It bears in late summer whorls of white flowers with hooked calyxes. Black horehound (*Ballota nigra*) also has downy, wrinkled leaves, but its flowers are purple and its smell disagreeable.

Horgen, tn., 10 m. s.e. of Zürich, on Lake Zürich, Switzerland, with industries of cotton, silk goods, and chemicals. Pop. (1900) 6,883.

Horitz. (1.) Town, Bohemia, Austria, 17 m. by rail n.w. of Königgrätz; has sawmills and cotton factories. Here, in 1423, the Hussites under Ziska defeated the imperial troops. Pop. (1900) 7,771. (2.) Village in Krumau dist., Austria, in the Bohemian Forest, 19 m. s.w. of Budweis. The peasantry periodically perform Passion plays.



Horizon.

O, Observer. P.S.H., Plane of sensible horizon. P.R.H., Plane of rational horizon. C.E., Celestial equator. N, S, North and south poles.

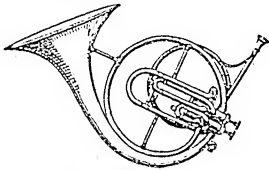
Horizon, the great circle of the celestial sphere of which the zenith and nadir are the poles. The plane of the 'sensible horizon' passes through the eye of the observer, that of the 'rational horizon' through the centre of the earth; but the distinction vanishes at the infinite distance of the heavens. The 'visible horizon' is, on land, broken by inequalities; at sea it is depressed by an amount, called the 'dip,' proportional to the elevation of the spectator.

Hormayr, JOSEPH, BARON VON (1782-1848), Austrian historian, born at Innsbruck, appointed historiographer of Austria and the imperial house (1815); in 1828 he left Vienna to represent the Bavarian court at Hanover and Bremen. Appointed (1846) director of the archives at Munich, he died there. He wrote over 170 volumes, among them *Geschichte der Tirol* (4 vols. 1802-8); *Oesterreichischer Plutarch* (20 vols. 1807-20); *Das Land Tirol u. der Tiroler Krieg* (2 vols. 1845).

Horn

Horn, CAPE, the southernmost point of S. America, in lat. 55° 59' S. It rises to a height of 1,390 ft., and is in Chilean territory. The Dutch navigators Schouten and Lemaire discovered and named it in 1616.

Horn, FRENCH (Fr. *cor*, *cor de chasse*), a brass wind-instrument which possesses a peculiarly tender and mellow tone. Originally its use was confined to the hunting field, but about the beginning of the 18th century it was



French Horn.

introduced into the orchestra. It consists of a number of spiral coils, having a funnel-shaped mouthpiece at the upper and a widely-expanded bell at the lower termination of the tube, which may have a total length of over sixteen feet. The natural sounds produced from the horn are those which form the upper partials of its fundamental tone. The length of the tube is varied by the introduction of sections of various sizes—called *crooks*—which, with two supplementary crooks (one lowering a semitone, the other a tone) and a *tuning-slide*, constitute the mechanism for securing accurate adjustment of pitch, and make the instrument capable of being played in all keys. With the exception of a few very low notes written in the F clef, music for the horn is always written in the G or treble clef, without sharps or flats, but with a key-signature indicating the crook to be used, the latter determining the actual pitch of the sounds produced. About 1770, Hampl of Dresden discovered that the pitch could be varied by introducing the open hand with closed fingers into the bell of the instrument, and by this means the intermediate notes required to fill up the gaps between the harmonic intervals could be produced. To render this *hand-stopping* unnecessary, the horn is now furnished with valves, usually two. The horn is a difficult instrument to play, and is never used singly in the orchestra (two or four being usually employed). See Berlioz's *Instrumentation* (new ed. 1904).

Horn, ARVID BERNHARD, COUNT (1664–1742). Swedish statesman, born at Vuorentaka in Finland. After serving against France in 1690–5, he was sent

(1704) as Swedish ambassador to Warsaw, where he was largely instrumental in obtaining the election of Stanislas Leszczyński, the Swedish candidate, to the throne of Poland. In 1710 he was appointed chancellor, and from 1719 to 1738 (at which latter date he was ousted by the *Habs*) he practically ruled Sweden, introducing a liberal constitution which converted the most autocratic into one of the most limited monarchies.

Horn, GUSTAV, COUNT (1592–1657), Swedish general, born at Örbys in Uppland. Having learned warfare under Maurice of Orange and Charles X., he accompanied Gustavus Adolphus to Germany in the Thirty Years' war. He commanded the left wing at the battle of Lützen (1632), cleared Alsace and Baden of the imperialists, but was taken prisoner at Nördlingen (1634). He later distinguished himself in the war against Denmark (1642).



Hornbeam.

1. Bract of male catkin; 2. flower of female catkin; 3. nut with scale; 4. ovary.

Hornbeam (*Carpinus betulus*), a British deciduous tree belonging to the order Amentaceæ. It may be known by its straight, slender, smooth, often twisted trunk; its simple, alternate, rough, elmlike leaves, with strongly-marked veins. In April it bears yellowish catkins, the female flower being followed by clusters of little nuts. The hornbeam was formerly much used in topiary gardens. The wood is of value on account of its exceeding toughness.

Hornberg, tn., grand-duchy of Baden, Germany, beautifully situated in the Black Forest, 27 m. S.E. of Offenburg by the remarkable Schwarzwald railway. Pop. (1900) 2,478.

Hornblende

Hornbill, an interesting bird, widely distributed in the warmer parts of the Old World, and constituting the family Bucerotidae.



Hornbill.

Hornbills derive their common name from the greatly developed bill, which is surmounted by a casque or helmet. Though the wings are powerful, the heavy, unwieldy body makes flight slow. The food consists usually of fruit and insects, but the larger forms are very indiscriminate as regards diet. The rough nest is placed in a hole in a tree, and the entrance is then closed up, apparently by the hen, until only a small opening is left. Through this the male feeds his mate, and she remains within until the young are hatched. This remarkable habit has given rise to many myths in the countries in which hornbills occur. Examples of hornbills are *Bucorvus cafer* of S. Africa and *Aceros nepalensis* of India.

Hornblende is the commonest mineral of the amphibole group, generally black in colour, but sometimes green or dark brown; sp. gr. 3.0, h. = 5.5. It is found in many lavas, in plutonic rocks, and in metamorphic schists, and is easily recognized by its dichroism and well-developed cleavages, which intersect at an angle of 124° in sections transverse to the prism axis. In metamorphic rocks this mineral usually forms irregular masses without definite crystalline form. Augite, which is almost equally common in rocks, is so like hornblende in colour, hardness, and specific gravity, that it can hardly be distinguished, except by its cleavage angle and by its optical properties when examined under the microscope. Hornblende decomposes with formation principally of chlorite, but also of epidote, calcite, and limonite. It is a complex silicate, containing calcium, magnesium, and considerable amounts of aluminium and ferric iron.

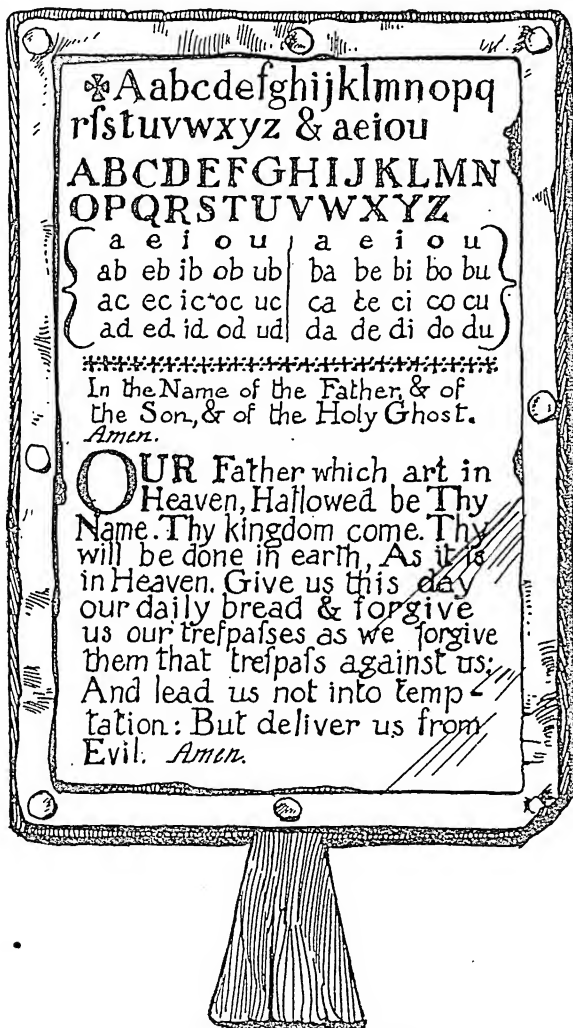
Hornbook, formerly used by children in learning to read, consisted of a tablet of wood on which was a piece of paper or parchment usually containing the alphabet, the nine digits, and the Lord's Prayer; the paper was protected by a thin layer of transparent horn, whence the name 'hornbook.' A projection of part of the wood formed a

Horncastle, mrkt. tn., Lincolnshire, England, 21 m. S.E. of Lincoln. The church of St. Mary dates, in part, from the 13th century. A great horse fair is held here yearly in the second week of August. Pop. (1901) 4,038.

Horne, RICHARD HENRY, or HENGIST (1803-84), English author, born in London, served as a midshipman in the Mexican war

Horne, THOMAS HARTWELL (1780 - 1862), English biblical critic, born in Chancery Lane, London. He published *Introduction to the Critical Study and Knowledge of the Holy Scriptures* (1818), after seventeen years' labour. From 1824-60 he was senior assistant-librarian at the British Museum, and wrote bibliographical, legal, and religious works. See *Reminiscences* by his daughter, Mrs. Cheyne (1862).

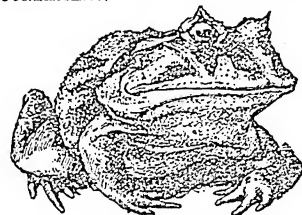
Horned Screamer (*Palamedea cornuta*), a S. American bird of a glossy black colour, with white on the head, wings, and abdomen. The head bears a long, slender horn. The bird belongs to the family Palamedeidae and the order Anseriformes. See SCREAMERS.



Common form of Hornbook.

handle. In some hornbooks the paper was pasted on to the wood, in others it was let into a space hollowed out to receive it. Sometimes there was no wood, and the paper was merely pasted on to the horn. Hornbooks are now extremely scarce. See Andrew Tuer's *History of the Hornbook* (1894).

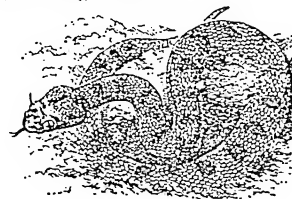
with Spain. But he also wrote tragedies and satires; investigated the employment of children in mines; carried on a correspondence with Mrs. Brown- ing, then Miss Barrett; and in 1843 published *Orion*, an epic poem. He resided in Australia (1852-69) as commissioner for crown lands.



Horned Toad.

Horned Toad (*Ceratophrys*), an amphibian with a triangular appendage on the eyelid. There are about ten species, found in S. America. The mouth is enormous, and the animals lurk among grass or earth, where they are concealed by their colour, on the watch for the frogs on which they chiefly depend for food. One species from Brazil (*C. dorsata*) reaches a length of six inches.

Horned Viper (*Cerastes cornutus*), a poisonous snake found in N.E. Africa, remarkable in that it has a projecting horn-like scale above each eye. It reaches a length of two feet and a half, and haunts sandy places, where during the day it lies buried, only the horns, nostrils, and eyes being visible.



Horned Viper.

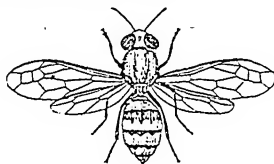
Hornel, E. A., Scottish painter, was born in Australia. In 1880 he entered the Edinburgh Art Schools, proceeding to Antwerp to study in 1883. He painted field-workers, etc., and was an influential member of the Kirkcudbright group or school of

painters. He collaborated with George Henry upon several pictures; but his visit to Japan (1893) determined the markedly decorative character of the design and the distinctive quality of the colour in his later work. *Summer*, in the Liverpool Gallery, is an excellent example of a motif concerned primarily with beauty of colour.

Hornellsville, city, Steuben co., New York, U.S.A., 75 m. S.E. of Buffalo. Large railway works. Pop. (1900) 11,918.

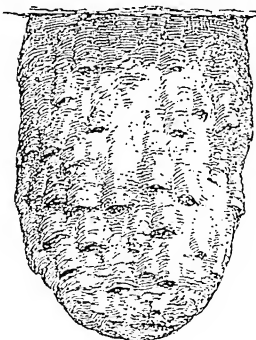
Hornemann, FRIEDRICH KONRAD (1772-?1801), German explorer, born at Hildesheim. The African Association of London engaged him to travel and explore in Africa, and (1797-8) he penetrated from Cairo to Murzuk, and thence across the Libyan desert. No details of his end have been recorded. From Tripoli he sent to England material which the society published as *Travels from Cairo to Mourzouk* (1802).

Horner, FRANCIS (1778-1817), Scottish politician, and one of the founders of and contributors to the *Edinburgh Review*; born at Edinburgh; Whig M.P. for St. Ives, Hunts (1806), and for Wendover, Bucks (1807); also chairman of the committee on gold bullion (1810). See *Memoirs*, ed. Leonard Horner (1843).



Hornet.

Hornet (*Vespa crabro*), a common European species of social wasp, distinguished by its large size and bright red-brown markings. All the colony dies off at



Hornet's Nest.

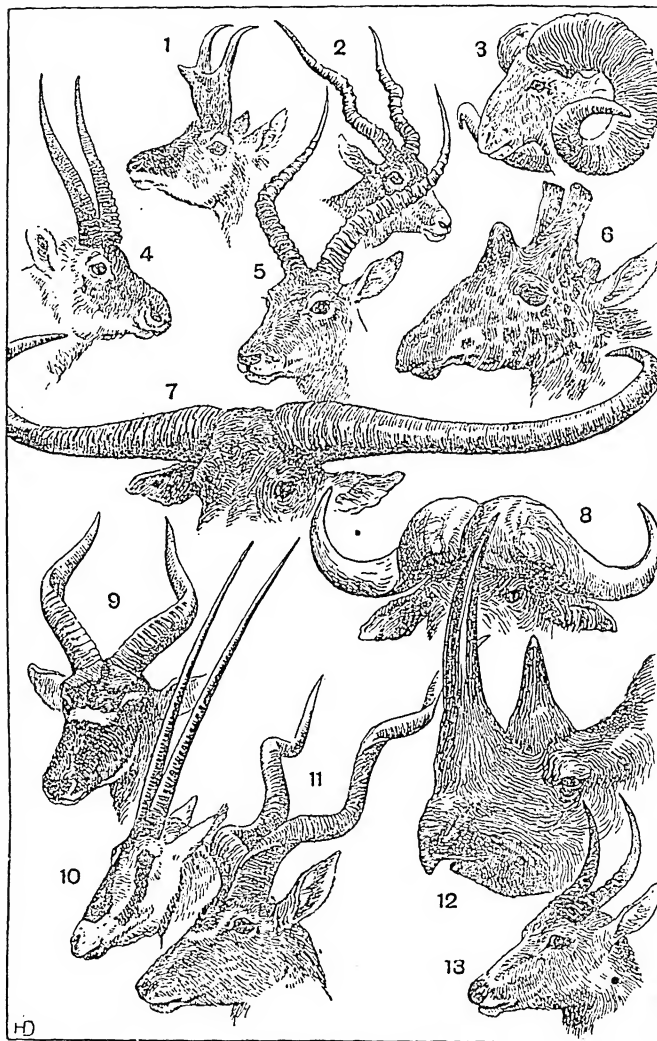
the approach of winter save a female, who in spring begins to build the nest in hollow trees or in outhouses. Later she is as-

sisted in her labours by workers. Hornets feed on other insects, including other wasps, and display great dexterity in catching their prey. The sting of the females is severe, but hornets do not usually attack man unless molested. See WASP.

Horning, LETTERS OF (Scots law), mean, in the words of

debtor was proclaimed a rebel with three blasts of a horn at the market cross, Edinburgh.

Hornpipe, the name of an obsolete musical instrument, used in the north-west of England to accompany a jig-like dance, which has appropriated the name. This dates from 1700, and was sometimes written in $\frac{2}{4}$ or $\frac{3}{4}$ time, but



Types of Horns.

1. Pronghorn. 2. Black buck. 3. Argali. 4. Chiru. 5. Palla. 6. Horned giraffe. 7. Assau buffalo. 8. Cape buffalo. 9. Bongo. 10. Beisa antelope. 11. Kudu. 12. African rhinoceros. 13. Reed buck.

Lord Kames, 'a letter from the king, ordering or commanding the debtor to make payment under the pain of being proclaimed a rebel.' They were formerly the commonest form of diligence against the person, but are now almost unknown. They are so called because the

more usually in common time. The best-known variety is the sailors' or college hornpipe.

Horns, as typically represented in the hollow-horned ruminants, are unbranched sheaths placed upon the top of cores of bone developed from the frontal bones of the skull, and are exemplified

in oxen, sheep, and antelopes. They differ from antlers, not only in the horny sheath, but in the fact that neither core nor sheath is shed throughout life. In some cases, as in the majority of antelopes, horns are confined to the male sex; in others they occur in both sexes. Functionally they are weapons, and can often be used with the most deadly effect. Certain other simpler types exist among ungulates, some of which seem to show transitional conditions between horns and antlers. In the prongbuck (*Antilocapra*) the remarkable horns are branched, and the horny sheath is periodically cast and renewed. In the giraffe the 'horns' are bony prominences, at first entirely separate from the bones of the skull, but later uniting with these, and covered by hair. Other remarkable horn-like structures occur among some of the extinct allies of the giraffe. The horn of the rhinoceros has no connection with the bones of the skull, and consists of a mass of horny fibres, growing from the skin, and suggesting a compacted mass of hair.

Hornsey. See LONDON.

Horn Silver is the naturally occurring chloride of silver, AgCl . It has a horny appearance, sp. gr. 5.6, h. = 1 to 1.5, is darkened by light, and occurs chiefly in Chile and Peru.

Hornwork (in fortification) is a form of advanced work consisting of two half-bastions and a curtain, with two long sides called wings, which are flanked by the main works in the rear. When the front is double-bastioned it is called 'crown-work.' See FORTIFICATION.

Horodenka, tn., Austrian prov. of Galicia, 24 m. N.E. of Kolomea. It has industries of linen, potash, and soap. Pop. (1900) 11,615.

Horologium, the Clock, a southern constellation placed by Lacaille in 1752 between Dorado and Eridanus. Alpha Horologii is a 'solar' star of 3.8 magnitude.

Horology is the science of measuring time, and of the constructive principles of machines for this purpose. The sundial is the earliest instrument of this kind; and the first advance upon it is said to be due to Plato, who invented the clepsydra, or water-clock. King Alfred, in the 9th century, used graduated candles, the burning of which marked the passage of time. Sand-glasses also were used from an early date, and are common even now.

The sun 'transits' or crosses the meridian at twelve noon, and the interval between two consecutive transits of the sun is a solar day. The earth makes its revolutions in almost uniform

time; but it also travels round the sun, and its rate of motion in this path varies; also the inclination of its axis to the sun is constantly changing; it therefore follows that no two solar days are of exactly the same length. As it would be impossible to be always changing our clocks at noon to agree with the daily transits of the sun, an average of all the transits of the sun in the year is taken, and this is known as 'mean time.' The difference between the actual transit of the sun and the average or mean time is called the equation of time; and tables giving the times of the actual transits of the sun and also of the fixed stars during the year are prepared at Greenwich. All over England, Scotland, and Wales the civil day is known as Greenwich mean time; but in Ireland time is reckoned from the meridian of Dublin, which is $6^{\circ} 20' 30''$ W. of Greenwich, so that Irish time is 25 min. 22 sec. slow of Greenwich mean time. As one degree is the 360th part of the earth's circumference, and as the earth revolves once in twenty-four hours, it follows that four minutes of time must be allowed for every degree.

These observations are generally made with the transit instrument. This is a telescope mounted somewhat like a cannon, having two trunnions upon which it can revolve. It is fitted on a stand, which must be fixed in such a manner that the telescope points exactly north and south when swung backwards and forwards, and when upright points to the zenith. There are usually three vertical wires crossing the view of the telescope, and also a horizontal one. The central vertical wire is coincident with the line of sight of the telescope. Through this telescope the passage of the sun or of a star across the meridian is watched; the exact time when it makes contact with each of the wires is noted, and the mean of these times is taken and compared with the clock.

Clocks.—The art of clock and watch making, it is thought, first took practical shape in Germany; and there is positive proof that, about 1364, Charles V. of France summoned one Henry de Vick from that country, commanding him to make and fit up a large turret clock at his palace in Paris. De Vick's clock was regulated by a balance, the pendulum not having been yet invented. The escapement is that part in a clock or watch which prevents its running down too quickly. It consists of the last and quickest moving wheel in the train, along with the pallets which communicate the energy to the pendulum or balance. A

train consists of a number of wheels which gear together. In a timepiece, the force, generated either by weight or spring, is transmitted by the train to the escapement; and in a clock there is also an additional train, for the purpose of making it strike the hours.

It will be noticed that the axis of the escape wheel in De Vick's clock is horizontal (Fig. 1). The

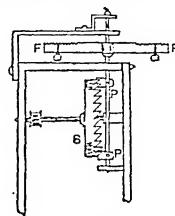


FIG. 1.

teeth of this wheel are sawlike in shape, and engage with two pallets P P on the verge, which is upright. Two arms FF are attached to the verge at right angles, and stick out on either side. On these arms are notches, from which are suspended two weights, one on either arm. In regulating the clock, these weights are moved nearer to or farther from the centre. This form of escapement, known as the verge escapement, is becoming scarcer every day.

For upwards of two hundred and fifty years this escapement, with its rude method of regulation, remained without advance, until Galileo discovered the pendulum. Although he conceived the idea of applying a pendulum to a clock, it was left to Huyghens, the Dutch philosopher, to perfect it. The same escapement remained in use, but the escape wheel was now placed vertical to the other wheels, and the power was transmitted to it by means of a contrate wheel—i.e. a wheel where the teeth project from the side of the rim instead of lying in the same plane. The axis of the verge was no longer upright, but horizontal; and the pendulum, being fixed to one end of the arbor, hung down and vibrated at the back of the clock.

A pendulum is to be considered as a falling body; and if it moved in a cycloidal path, the time of its vibrations, although of different amplitudes, would remain the same. But, in actual practice, the path of the pendulum is circular, and any increase in the extent of its vibration will take longer time. This variation is known as the circular error; and in order to keep it as low as possible, the swing of the pendulum is kept within reasonable limits, so that the arc described

by the pendulum varies very little from a cycloid. There are other errors which affect the pendulum, such as the barometric error, due to any change in the density of the air through which it swings; the temperature error, caused by the expansion and contraction of metals; and, lastly, the escapement error, being the extent to which the escapement may interfere with the regular movement of the pendulum. During an impulse given by the escapement to the pendulum, the first half helps it down, and the second half assists it to ascend on the other side. Here we have gravity helped and hindered, the one action compensating for the other. The temperature error is the one which most affects the time of a pendulum, and, to counteract this, the compensation pendulum was devised. The length of a pendulum is calculated from the point of suspension to an imaginary point in the pendulum ball, called the centre of oscillation, this point being slightly below the centre of gravity of the pendulum. As every change of temperature alters the length of the pendulum rod, this point will be either raised or lowered, causing in the former case quicker and in the latter slower vibrations. The object of compensation is to keep the centre of oscillation always at the same distance from the point of suspension. John Harrison, who began life as a carpenter, invented the first compensation pendulum, known as the grid-iron. It has long been superseded by others, and among the best of these may be considered George Graham's mercurial one (Fig. 2).

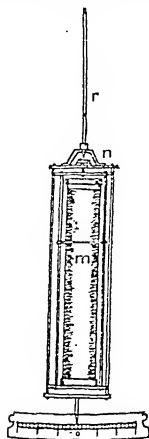


FIG. 2.

A glass jar *m* contains mercury, placed in a brass cup, while another brass cup is used to cover the top. Immediately above *m*

will be noticed a brass ring; this is simply for the purpose of securing the safety of the jar. The outer frame is a fixture attached to the rod *r*, but the inner stirrup is movable by means of the nut

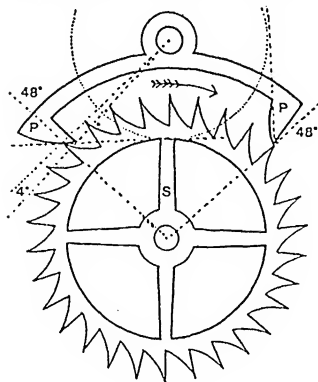


FIG. 3.

n, seen inside the bridge at the top of the bob for the purpose of regulation. The expansion and contraction of the mercury, compensating for the same alteration in the pendulum itself, keeps the centre of oscillation at the same distance from the point of suspension.

About 1656, Dr. Robert Hooke, professor of geometry in Gresham College, London, invented the anchor escapement (Fig. 3). The verge escapement, while requiring considerable motive-force, was extremely sensitive to any variation in the power. The pendulum was short and light, and took a large arc of vibration, giving prominence to the circular error. With the new escapement longer and heavier pendulums were used, and the arc of vibration was lessened to such an extent that the circular error became insignificant. The heavier pendulum was also less influenced by any irregularity in the clock itself, or in the force which kept it in motion. This escapement is still the one most commonly used, being easy to make, and giving very good results: *s* is the escape wheel; the arrow shows the direction in which it turns; *P* and *P'* are the pallets.

Towards the end of the 17th century, George Graham, doubtless on the initiative of Hooke, produced his *dead-beat* escapement (Fig. 4), which is the one now used in high-class timekeepers. In the verge and anchor escapements, when a tooth of the escape wheel has given its impulse, and escaped from the one pallet, the other pallet receives a tooth on its face, which not only checks the forward motion of the wheel, but drives

it back a certain distance; from this action the anchor is also known as the recoil escapement. Again, any increase of power in a recoil escapement causes the timepiece to gain, the opposite being the effect in the *dead-beat*. In the latter, when a tooth in the escape wheel has given its impulse to the one pallet, the other pallet receives a tooth and stops the wheel; but, owing to the face of the pallet being concentric with the arbor, to which it is fixed, the wheel is not driven back, but locked, and it remains stationary until the next forward movement: this gives the name of *dead-beat*. In this escapement the vibrations of the pendulum are not allowed to go beyond certain limits, and the impulses being equal, it is much superior to the anchor: *s* is the escape wheel; *P*, *P'*, the pallets.

Large clocks, such as those required for church steeples and the towers of public buildings, are subject to irregularities which do not interfere with the ordinary house clock. They have from two to four dials, and the hands are of considerable size and weight. The hands are poised by short levers with weights attached; otherwise, when descending from 12 to 6 they would unduly press the clock forward, and in ascending from 6 to 12 they would greatly retard it. In stormy weather they are forced backwards and forwards by the wind, and in winter they have sometimes to contend with snow. In order to overcome these difficulties, a greater weight than would otherwise be necessary is used; and as this force is sometimes assisted and sometimes held back, it depends on the escapement whether the variations will show in the timekeeping. To

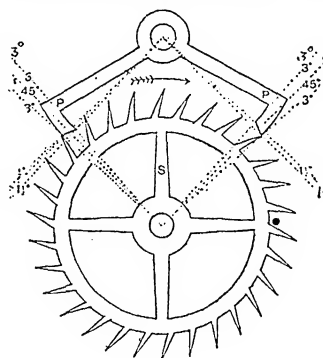


FIG. 4.

avoid the consequences of these irregularities, Mr. Denison, Q.C., introduced his form of the *gravity* escapement (Fig. 5). In this escapement the pendulum does not receive its impulse from the train,

but from a weight raised by the clock through a certain distance, which, on being allowed to fall, imparts a constant force. There are two escape wheels *SS'* on the same arbor, each having three teeth, and three pins between them for raising the pallets *PP*, the pallets swinging in the same plane between the two wheels. When the pendulum swings to the right it releases the escape-wheel tooth from the stop *E*, and the wheel instantly flies forward through 60° ; and as this rapid movement might endanger the security of the action, by the wheel gathering momentum and striking too hard a blow on the next stop, a fly with vanes to

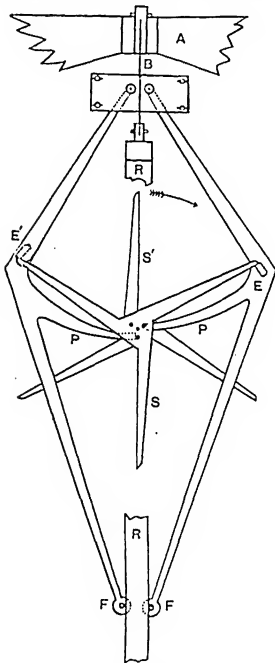


FIG. 5.

catch the wind is connected with the escape-wheel arbor. The pallets, with their arms, constitute the raised weights (these, on falling, give an impulse to the pendulum to keep it in motion); *EE'* are the two stops, one on the outside of the one pallet arm, engaging with the front escape wheel, and the other on the reverse side of the other arm, engaging with the back wheel teeth; *A*, the bracket which supports the weight of the pendulum; *B*, the pendulum spring; *R*, the pendulum rod; and *FF*, the two beat-pins which engage with it on either side.

Sixty years ago, Alexander Bain was the first in Britain to use electricity in connection with clockwork. Electricity is

generally used in three ways—(1) to control clocks at a distance from a standard clock; (2) to bring the different clocks in a circuit to the same time, usually at the end of each hour; and (3) as the motive-power. In the first method, the pendulum of the controlled clock is of the same theoretical length as the standard one. The pendulum ball is a hollow cylinder coiled with insulated wire; it passes over two permanent magnets, and reversed currents, sent by the oscillations of the standard pendulum, repel or attract the controlled one, bringing their oscillations into unison. Another and more popular method is to have a simple dial of one ratchet wheel having 120 teeth. This wheel carries the minute hand, and receives an impulse forward every half minute. This forward movement is caused by a rocking armature pivoted at one end, and provided with a clutch, which is made to slide over the teeth by the current being sent along the wire and exciting an electro-magnet which pulls the armature towards itself. Immediately on the circuit being broken, a spring which is fixed to the armature pulls it back into its normal position; the clutch at the same time catches on the face of a tooth in the wheel and pulls it over. The wheel has also another clutch, to prevent it from taking more than one tooth at a time. The second method is worked by having two clips at the top of the dial, which, by means of an electric current, are made to close down over the minute hand exactly at twelve o'clock, thus bringing the clock to time, whether it has gained or lost. The third method, by which electricity is the motive-force, and a controlling clock is dispensed with, has never been a success.

Compressed air has in recent years been used to move dials, which are simply time indicators, the air being forced along pipes at intervals, controlled by a standard clock. In a very large clock with four dials, in the tower of the Philadelphia City Hall, U.S.A., compressed air is the power used for driving the hands, and the motion is controlled by a small clock inside the tower.

It is believed that early horological machines had no striking part. The first step in this direction was an alarm-striking apparatus, and afterwards a hammer was made to strike a bell a certain number of times, according to the hour. This required a train of wheels to itself; and a contrivance called a 'count wheel' had its circumference so divided, in proportion to the hour, that, at the finish of striking, a lever fell into a notch on the edge of the wheel,

and locked the train until the next hour. This arrangement has the serious drawback that, if the hands are turned back, the clock will strike in advance of the hour indicated. A more modern and improved device is the hour rack. This is the segment of a circle with twelve teeth cut in the edge. From the centre of motion of this piece a small lever projects, which falls into steps of a relative depth on the edge of a snail which is fixed to the hour wheel. The clock in striking gathers up the rack by a pallet, which is fixed to a wheel, which makes one revolution for every blow struck. Bells are most commonly used to make the hours audible; but there are other means, such as gongs, which are simply coiled wires, and give out a softer and more mellow tone. The most recent contrivance is the Harrington tube—a steel tube of such diameter and length as will give the desired pitch. The hammer face is covered with chamois leather, and is made to strike the tube, which is suspended by a cord at the upper end. A trichord similar to those of a piano is also sometimes used. The striking may be either simple or complicated, as when a chime is given on bells or gongs, or both together. In a chiming clock an extra train of wheels is necessary for that purpose. The chimes are generally struck on eight or ten bells; and in clocks with the Harrington tubes there is always the full octave, with an extra long and large tube for the hours. Where gongs only are used, there are usually four for chiming and one for the hour, though recently a few very fine clocks have been made having the full octave and an additional gong for the hours.

When a clock is wound up, the cord by which the weight is suspended is coiled round a drum, and in this way the raised weight is endowed with the necessary energy to keep the clock going. The drum is attached to the axis of the first wheel, which in most cases drives the centre spindle. On this arbor is a wheel, which transmits the motion by means of its pinion to another wheel. This wheel, again, conveys the motion to the escapement, and thus the energy is constantly supplied to keep the machine in motion.

The centre spindle revolves once in an hour, and is prolonged so as to come through the dial. On its outer end it has a wheel fitted friction-tight, whose socket also projects beyond the dial and carries the minute hand. This wheel gears into another of the same size, intermediate between the first and the hour wheel. The second wheel has a pinion,

generally of six leaves, and gears into the hour wheel, which must have twelve times the number of teeth, thus bringing down the revolutions of the last wheel to once in twelve hours. The hour hand is attached to the hour wheel, which rides concentric with the first dial wheel by means of a larger socket. Where seconds are shown, the end of the escape-wheel arbor comes through the dial, and on this is fixed the seconds hand. The accompanying illustration, partly in section, shows the going train of an ordinary clock. In a high-class regulator, the general arrangement would not be very much altered.

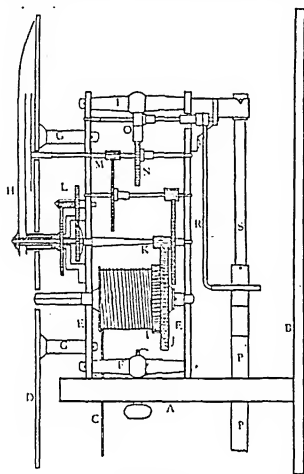


FIG. 6.

A, the seatboard, to which the clock is fastened by screws. B, the back of the case. C, E, the frames which contain the train, held together by the pillars D. F, the barrel, on which the cord G, which supports the weight, is wound. In a clock driven by a mainspring, the spring would be enclosed in this barrel, but the diameter would be as large as the space allowed. The axis or arbor of the barrel is prolonged through the dial H, and squared to receive the winding key. The great wheel J rides on the same arbor. G, the pillars by which the dial is fastened to the clock, plus being passed firmly through the ends. K, the centre pinion, which goes through the dial and carries the minute hand. L, the minute, hour, and seconds hands. M, the dial wheels. N, the escape wheel; and O, its pinion. P, the pallets; and Q, the crutch or fork attached to the same arbor, the fork engaging the pendulum rod R. S, the pendulum spring.

Raised weights were at first used as the motive-power for driving clocks; and where there is sufficient room, and no necessity for moving the timepiece, this is the best method, as, the force of gravity being constant, the weight always falls with an equal force. But a weight-driven machine cannot be portable; and on the invention of the mainspring by Peter Hele of Nuremberg, about 1500, smaller clocks were made, which could be more easily moved. The mainspring of a clock or watch is a band or ribbon of steel, which, on being wound

tightly round an arbor, endeavours to unwind itself, and in so doing gives out the power in the work of making the timepiece go. The force of a spring varies considerably, being weaker when nearly run down, and much stronger when wound up to the top. In 1525 Jacob Zech of Prague invented the 'fusee,' which is a hollow-sided cone for the purpose of equalizing the pull of the mainspring, the large diameter at the one end giving out the weaker force of the spring, and the smaller diameter at the other being for the greater force when the spring is fully wound.

Watches.—When watches were first made is unknown, but it is supposed to have been shortly after the invention of the mainspring. The escapement used was the verge, similar to the one used in clocks; but instead of an arm with weights there was a wheel equal in weight all round—viz. the balance wheel, which is used to this day. In the earlier watches catgut was used instead of chains for conveying the force of the mainspring to the fusee. The gut was fastened at one end, in the edge of the box containing the mainspring, and was passed round this box several times. The other end of the gut was fastened to the fusee at its largest diameter. On the key being put on the fusee square and turned, the gut was wound round the fusee.

These watches had no balance spring, but depended for their regulation on a contrivance which consisted of an endless screw and small wheel attached to the mainspring arbor. This, on being wound up or let down, caused the watch to go respectively quicker or slower.

Hooke invented (c. 1660) the balance spring, and on this being applied to watches, they were found to go so much better that a minute hand was added, and the hour divided into sixty minutes. The balance spring is a very delicate ribbon of steel of spiral form. Its inner end is fastened to a collet which slips friction-tight on the balance-wheel arbor, and the outer end is held in a stud fixed to the movement. This spring takes the place of gravity. The balance, on being swung to one side, winds up the spring; the energy stored in the spring then reacts, and causes the balance to vibrate as far on the other side, the escapement supplying the power to keep up this action.

Graham, already mentioned, applied his dead-beat clock escapement to watches in what is called the cylinder escapement. This escapement is still largely used for cheap Swiss watches, and gives good results.

The lever escapement—decidedly the most useful of all the escapements ever applied to watches—is the one now most generally in use. For ordinary purposes, it has proved itself to be superior even to the chronometer. In its first form it was not detached—that is to say, the balance wheel was never entirely free from the escapement. The detached form of this escapement is the production of Mudge (c. 1760). The idea is to have the vibrations of the balance as far as possible free from any interference of the train. The lever escapement in the English form (Fig. 7) consists of an escape wheel S, with long pointed teeth, working into a pair of pallets PP, these having pieces of ruby sunk into their working faces. Fastened to the pallets is a lever L, with a notch at one end. This notch engages with a small pin of ruby I, set into a steel roller R, on the axis of the balance wheel B. In its action, the escape wheel applies its power through the impulse faces on the pallets, and the lever communicates this to the balance by means of the pin which enters the notch. The balance, in receiving this impulse, is connected with the escapement through an arc of 30°; and immediately after, the lever is drawn slightly to one side, by reason of the pallet faces being undercut. It then rests on one of the banking pins AA, while the balance vibrates entirely free, winding up the balance spring. Having expended its energy in this direction, the balance spring exerts its force to make it return. On returning, the ruby pin re-enters the notch, unlocking the wheel, which again gives out its power on the other pallet; and the lever flies over to the other side, again communicating an impulse to the balance, but in the opposite direction, and rests on the other banking pin, leaving the balance free to continue its vibration. There is a small pin n in the lever, immediately behind the notch; the duty of this pin is simply to prevent the lever getting out of position, so that it may be ready to receive the ruby pin on its return. A small hollow is cut out of the edge of the roller to allow it to pass.

The chronometer escapement (Fig. 8) is the one applied to the best class of portable timekeepers, such as are used by astronomers, naval and scientific men. While simple in its action, it does not admit of any but the finest workmanship. About the middle of the 19th century it was much in favour for pocket watches; but from its great delicacy, and the necessity for the most careful treatment, it was rapidly displaced for this pur-

pose by the lever. It was invented by Pierre Le Roy (c. 1747), but was much improved and brought to its present form by Earnshaw, according to the description given by him to the Board of Longitude (March 7, 1805).

It has remained almost the same in construction from the time of Earnshaw to the present day. S is the escape wheel turning in the direction of the arrow. When the balance B is set in motion, the discharging pallet A comes in contact with the gold spring c, and forces it back, carrying with it the detent D, which bends at E, this part of the detent being reduced to form a spring. The escape wheel is now released; a tooth falls on the pallet P, which is a stone let into the roller R. The escape wheel communicates an impulse to the balance, and as soon as the pallet has turned sufficiently to allow the escape-wheel tooth to

operation. This escapement is more highly detached than any other, the balance only receiving its impulse at each alternate vibration. In the lever and chronometer escapements, the full vibration of the balance should be about a turn and a quarter.

Change of temperature has a very considerable effect upon the balance spring, and also upon the balance; and in a watch which is uncompensated the variation may show as much as half a minute in twenty-four hours, rendering it unfit for any scientific purpose. An increase of heat has the effect of lessening the elasticity of the balance spring, the result being a loss, and at the same time the balance expands, causing the centre of gyration to move farther from the centre of motion, thus adding to the error. Harrison was the first to apply a contrivance for the purpose of counteracting this. It consisted of a bimetallic arm of steel and brass,

arms outwards. Should it be found that the action is not sufficient, one or more screws are moved forward towards the cut parts of the rim, thus increasing the effect of compensation. The regulating is effected by means of the two screws NN opposite the ends of the balance arms, which are screwed in to make the piece go quicker, and out if it is desired to make it go slower.

In this article only those escapements which are now in actual use have been taken notice of. There have been many others, which have been discarded either owing to their complication or extreme delicacy. Of recent years there has been only one innovation worth mentioning—viz. the Karrusel. This consists of a small frame which revolves and carries the escapement. The idea is to keep the whole escapement constantly turning, in order to eliminate the variations which exist between the different posi-

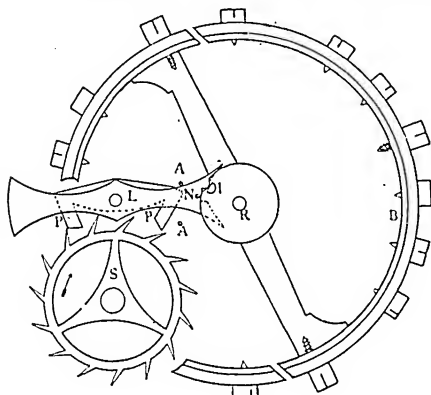


FIG. 7.

drop off, the tooth in front is caught on the stone inserted in the detent at R, the detent having sprung back into its place immediately on getting free from the discharging pallet. There is a screw, not shown in the drawing, which catches the detent on its shoulder and prevents it from going too deep into the wheel. The balance is now free to continue its vibration, winding up the balance spring until its energy is exhausted. The balance spring now asserts itself by pulling the balance back, and the discharging pallet again engages the gold spring; but this time the spring yields easily, the point of the detent being shorter, and the gold spring is pulled away from it. The balance, having performed the full extent of its vibration, is again brought back by the tension of the balance spring, and renews its former

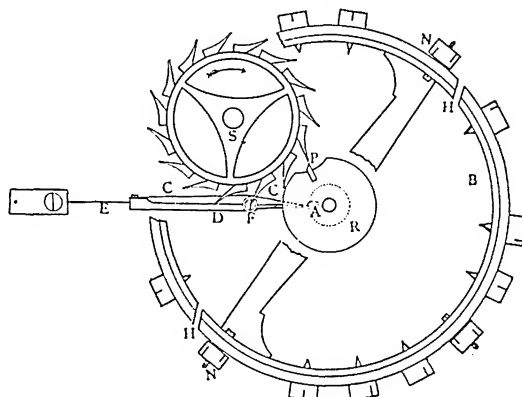


FIG. 8.

the unequal expansion of these materials causing the arm to act automatically on the balance spring, somewhat after the same manner as in moving the regulator by hand. Pierre Le Roy did not approve of the compensation being applied to the balance spring, and to him belongs the credit of applying it to the balance wheel itself, leaving the spring entirely free. The same combination of brass and steel was used, fixed together by pins. This clumsy method was improved upon by Earnshaw, who fused the brass on the steel. A balance is shown at Fig. 8; the inner part is of steel, and on the outside of the rim there is a lamina of brass. the rim being cut right through at HH. When the temperature rises, the brass expands more than the steel, and bends the arms inwards; and when it falls, the brass contracts, pulling the

tions in which a watch may be placed. This arrangement has been the means of giving very good results. In the Kew Observatory (near London) watch trials for 1900, out of the first fifty-one watches which were awarded 'Class A' certificates, thirty-three had the Karrusel.

See the following standard works: Thomas Reid's *Treatise on Clock and Watch Making* (2nd ed. 1843); Claudius Saunier's *Treatise on Modern Horology* (1881), and *Watchmaker's Handbook* (3rd ed. 1891); Sir Edmund Beckett's *Clocks and Watches and Bells* (8th ed. 1903); Benson's *Time and Time Tellers* (2nd ed. 1902); David Glasgow's *Watch and Clock Making* (1883); F. J. Britten's *Watch and Clock Maker's Handbook, Dictionary, and Guide* (1892); also the *Horological Journal*.

Horoscope. See ASTROLOGY.

Horowitz, tn., W. Bohemia, Austria, 29 m. S.W. of Prague; has iron and coal mines, and manufactures of metal wares, matches, etc. Pop. (1900) 3,600.

Horrocks, JEREMIAH (?1617-41), English astronomer, born at Toxteth, near Liverpool; was the first observer of the transit of Venus, described in *Venus in Sole Visa, Anno 1639*, published in Germany in 1662. Horrocks also deduced the solar parallax, correcting the solar diameter, and made observations on the tides. In 1678 the Royal Society published *Jeremie Horroccii Opera Posthuma*.

Horse (*Equus caballus*), a highly specialized member of the order Ungulata. From its nearest allies, the asses and zebras, the horse differs in the combination of the following

extremity. Owing, in the first place, to the fact that the horse walks on the tip of its toe, and, second, to the great elongation of this toe, the joints of the limb occupy somewhat peculiar positions, and are misnamed in ordinary language. Thus in the fore-limb the arm-bone (humerus) is bound down by the skin of the body-wall, so that the elbow joint is very high up; the joint called the 'knee' is the wrist; the fetlock corresponds in ourselves to the joint between palm-bone (metacarpal) and digit; while the two joints of the fingers are called respectively pastern and coffin-joint. In the hind limb the thigh (femur) is bound down with the skin of the body-wall as the humerus is; the joint corresponding to the knee-joint of man is called the stifle, the ankle is

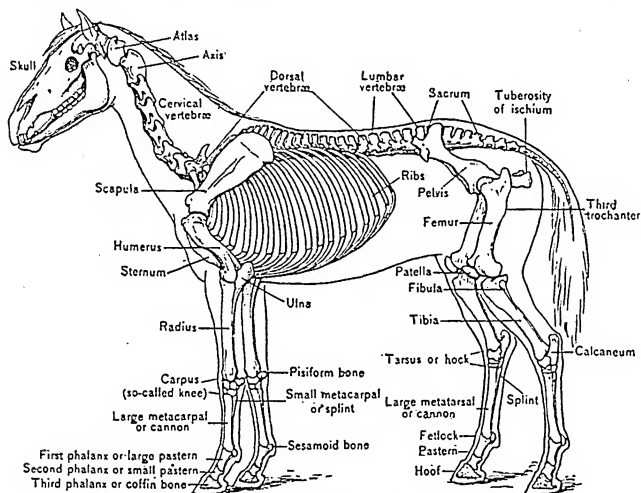
ruminants, the odontoid process of the second vertebra, or axis, has assumed a spout-shaped form. The bodies of the cervical vertebrae form ball-and-socket joints, and so help to give its great mobility to the elongated neck. The neural spines of the dorsal vertebrae are very high in the anterior region, and to them is attached the ligamentum nuchæ, or ligament which supports the weight of the heavy head. There are eighteen or sometimes nineteen pairs of ribs, and, as in ungulates in general, collar-bones (clavicles) are absent, whence the characteristically narrow chest. The shoulder-blade (scapula) is long and narrow, with a feebly developed spine. In the fore limbs the ulna is rudimentary, and is firmly fused to the radius. The palm-bone (metacarpal) of the middle finger is very well developed, and is called the cannon-bone; at its sides are 'splints,' which represent the remnants of two lateral metacarpals. At the end of the cannon-bone are the phalanges of the middle finger. In the hind limbs the thigh (femur) has an extra process for muscular attachment known as the third trochanter, the fibula is a mere rudiment, and the cannon-bone with splints and phalanges is present as in the fore limb.

When all the teeth are in position, the dental formula is as follows:

$$\text{I } \frac{3}{3}, \text{ c } \frac{1}{1}, \text{ p } \frac{4}{4}, \text{ m } \frac{3}{3} = 44;$$

but this formula is largely theoretical. The incisors of each jaw are in very close contact, and have broad crowns. Each contains a deep pit formed of enamel, which is partially filled with cement. This—a unique structure among living mammals—constitutes, as the tooth begins to wear, the so-called 'mark,' by means of which it is possible to tell approximately the age of the animal. The pit does not extend to the bottom of the tooth, and is obliterated by wear when the horse has attained a certain age. The canines are absent in the female, or if present are entirely rudimentary, and in the male are compressed, pointed, and smaller than the incisors. The functional cheek-teeth have very long crowns, and, as they wear away at the surface in the process of mastication, are pushed up from below. Their structure is complex, the enamel which covers the surface being, deeply folded, so that the worn tooth shows a series of ridges, which make it an exceedingly efficient grinding instrument.

In regard to the internal anatomy it may be sufficient to say that the stomach is simple, instead of chambered as in rumi-

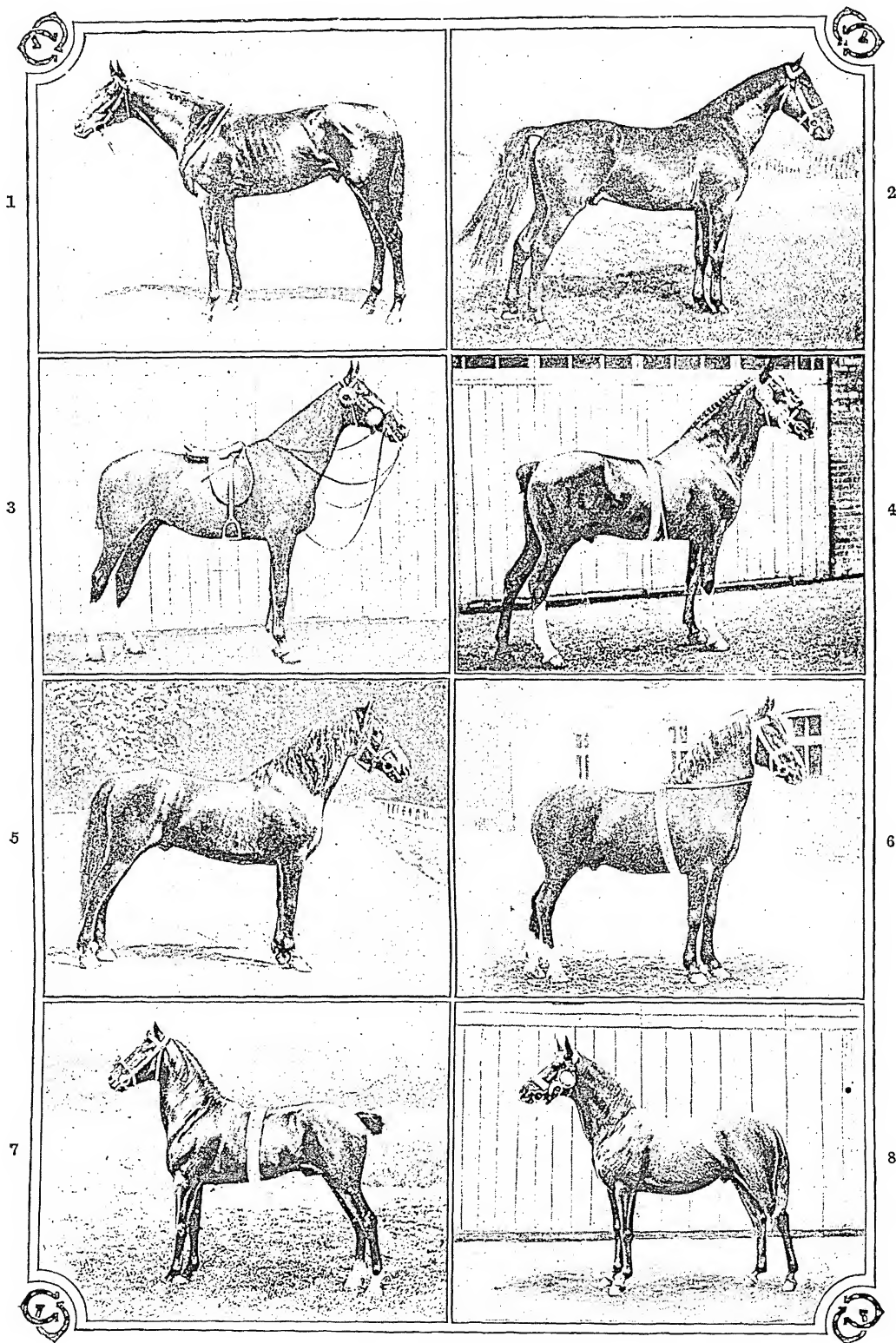


Skeleton of Horse.

characters. It has a bare callosity ('chestnut') on the inner side of the hind limbs. The mane is long and flowing, the tail is covered with long hairs from the root to the extremity, and as compared with asses and zebras, the head is proportionately smaller, the ears shorter, the legs longer, the hoofs broader. In domesticated forms the colour varies very much, but stripes rarely occur. The height of some domesticated forms, which may reach six feet, greatly exceeds that of any wild member of the family.

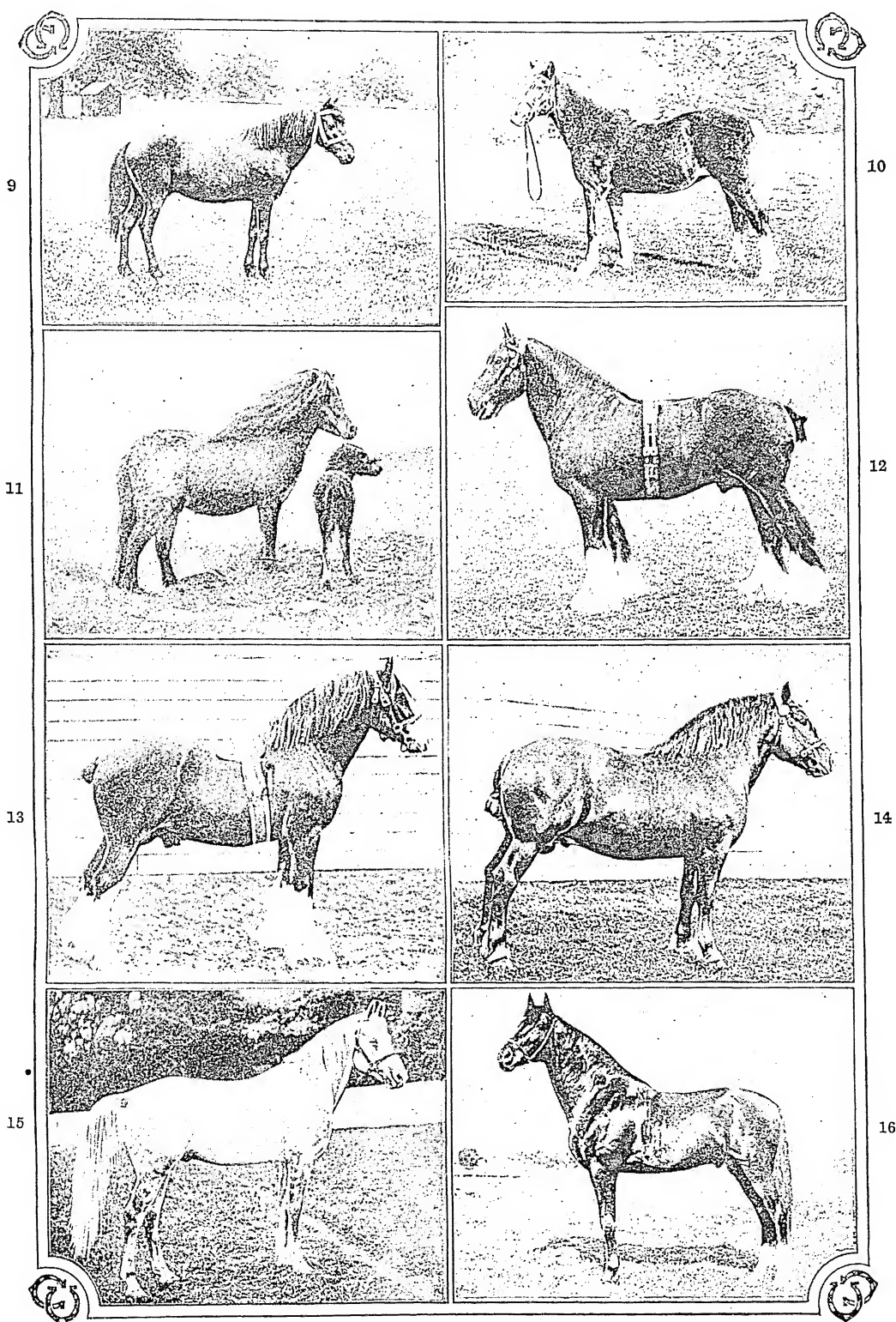
While the majority of mammals have their limbs terminating in four or five digits, the horse alone has but one toe on each foot. This toe has a greatly developed nail or hoof, on which the animal walks, and is the middle digit of the typical

termed the hock, and the other joints fetlock, pastern, and coffin, as in the fore limb. The skeleton of the horse shows many striking peculiarities, which combine to give the animal its characteristic strength and swiftness. The skull is very long, the length being especially due to the facial portion, which not only carries the six large functional cheek-teeth, but has also a considerable space or diastema separating these teeth from the front teeth. It is in this space that the bit is placed. The orbit or socket for the eye is completely surrounded by bone, and the nasal cavities are large. The back-bone consists of seven cervical, eighteen dorsal, six lumbar, five sacral, and from fifteen to eighteen caudal vertebrae. As an interesting example of convergence may be mentioned the fact that, as in



Breeds of Horses.—I.

1. Thoroughbred, 'Rocksand,' winner of Derby, 1903. 2. Yorkshire coach horse. 3. Hunter gelding. 4. Hackney. 5. Cleveland bay.
6. Pack horse, breed now nearly extinct. 7. Hackney pony. 8. Polo pony. (Photos, 1, W. A. Rouch; 2-8, Babbage.)



Breeds of Horses.—II.

9. Dartmoor pony. 10. Welsh pony. 11. Shetland pony. 12. Shire horse. 13. Clydesdale. 14. Suffolk. 15. Arab, 'Safran.'
 16. American trotter, 'Allerton.' (Photos—9, 11, and 15, Reid, Wishaw; 10, 12, 13, and 14, Babbage.)

nants; but the small intestine is very long (from eighty to ninety feet), and there is a large caecum.

In the wild or semi-wild states horses live in large droves, headed by an old stallion. They are essentially inhabitants of open country, and feed entirely upon the herbage of the plains. In its wild state the true horse appears to have been confined to the steppe country of Europe and Asia, and was probably domesticated in Europe by the men of the Stone Age. It is probable that the wild ancestral form was the tarpan, a recently exterminated horse-like animal which inhabited parts of the Russian empire. Some authorities, however, believe that the tarpan was a domesticated horse, which had reverted to the wild state. Possibly, as in the case of other domesticated animals, more than one nearly related species went to the making of the horse. In this connection it is interesting to notice the recent (1901) bringing to Europe of a drove of colts of Przewalsky's horse, which was first described in 1879, and was long believed to be a hybrid. The drove mentioned has afforded sufficient material to prove that this wild horse must rank as a distinct species (*Equus Przewalskii*), differing in several respects from the common horse. There is some reason to believe that the domesticated horse of Mongolia, together perhaps with certain races of European ponies, are derived at least in part from Przewalsky's horse. Professor Noack of Brunswick, who has carefully studied the last named, especially emphasizes the similarity with certain races of ponies.

To the horse family, Equidae, belong, in addition to the true horses, the asses, zebras, quaggas, which will be found discussed in separate articles; in all essentials their structure is the same as that of the horse. The existing members of the Equidae show their high specialization, notably in the fact that the limbs terminate only in a single toe, and that the teeth display great complexity. Among certain extinct species of the genus *Equus* the cheek-teeth are of slightly simpler structure, but the animals seem otherwise to have been like the existing species. On the other hand, in *Prototippus* from America and *Hipparion* from Europe and Asia, not only were the cheek-teeth shorter-crowned and simpler, but each foot bore three toes. In the *Anchitherium* of Europe and America, the teeth were still simpler, and the lateral toes of the foot larger. The characteristic 'mark' of the incisor teeth was only indicated, and that

in a single species, and the size in some species was no greater than that of the sheep. In *Hyraotherium*, a fossil found in still lower beds, there were four toes on the fore feet and three on the hind; the size did not exceed that of the fox, the teeth were low-crowned and simple. A still earlier form, *Phenacodus*, had five toes on each foot, and the teeth bore tubercles in place of ridges.

As yet no adequate explanation of the absence of the horse from America in the historic period has been offered, but while ungulates were in geologically recent times abundant in S. America, at the time of the Spanish conquest very few species were found living there.

Horseflesh has been extensively eaten in Paris since the German siege of 1870-1, as many as 36,000 (inclusive of asses and mules) being slaughtered annually; and there, in 1904, a municipal abattoir or slaughter-house was opened at Vaugirard.

See Sir William Flower's *The Horse* (1891); *Mammals, Living and Extinct* (1891), by the same and Lydekker; as well as Huxley's *Anatomy of Vertebrated Animals* (1871); J. McFadyen's *Anatomy of the Horse* (1884); Ridgway's *Origin and Influence of the Thoroughbred Horse* (1905); Speed's *The Horse in America* (1905); and for the ancestry, Nicholson and Lydekker's *Manual of Palaeontology* (1889), vol. ii.; and for the bearing of this ancestry on evolution problems, Wallace's *Darwinism* (1889).

AGRICULTURAL HORSES.—There are four distinct breeds of agricultural horses in the United Kingdom—namely, Clydesdales, Cleveland bays, Shires, and Suffolks. Each is represented by a special society, and possesses a stud-book.

The *Clydesdale* is the favourite Scottish breed, and is found also in the northern counties of England. According to Youatt, the breed owes its origin to one of the dukes of Hamilton, who crossed some of the best Lanarkshire mares with Flanders stallions. The result was a horse of extraordinary power and activity, varying in colour from brown or bay to black and dappled gray, carrying an abundance of hair on the fetlocks, and of flat, massive bone.

The *Cleveland bay* was always a great favourite in Cleveland, a district of strong land in N. Yorkshire. The colour is bay, with black points, with clean legs free from long hair. The breed was, according to Low, the result of progressive mixtures of the blood of horses of higher breeding with mares of the common race, and was peculiar for its adapta-

bility for ploughing, trapping, and saddle work.

The *Shire horse* is the most important English draught-horse, and has long been indigenous to the rich clay soils of Leicestershire, the Midlands generally, and the eastern counties. They are descended from the Old English black-horse, originally improved by Bakewell. The Shire horse varies in colour, being brown, light or dark bay, gray, and black. The bone is massive and flat, and the fetlocks carry an abundance of 'feather' in the form of long, silky hair. They are very active, and trot with fine action. The Shire horse is the grandest draught-horse in the world.

The *Suffolk horse* is of chestnut colour, with a white star on the forehead. They are smaller than Clydesdales or Shires, not often being higher than sixteen hands. These horses are rather round in bone, and comparatively free from hair on the fetlocks. Their compact form has gained for them the name of Suffolk Punches, and they are highly esteemed for activity and honesty in work.

The carriage-horse is usually a *hackney*, a type of very symmetrical proportions, and much lighter and faster than the middle-weight draught-horse. The *cob* is a stoutly-built short-legged animal of from thirteen and a half to slightly over fourteen hands. See HORSE-RACING.

DISEASES.—Equine diseases may be roughly grouped into four classes—viz. (1) bacterial diseases; (2) organic diseases; (3) diseases of the organs of locomotion; (4) parasitic diseases.

Bacterial diseases include all the contagious and infectious disorders of the horse, such as strangles, glanders, farcy, influenza, contagious pleuro-pneumonia, tuberculosis, and certain non-contagious diseases, including anthrax, tetanus, purpura-hæmorrhagica, malignant oedema, septicæmia, pyæmia, and S. African horse sickness.

Strangles (so called from the difficulty in breathing it often produces) is a common and widely-spread disorder peculiar to horses, asses, and mules. It exhibits itself chiefly as an infectious catarrh of the mucous membrane lining the upper air passages, accompanied, as a rule, by swelling and suppuration of the lymph glands in the region of the throat. The cause is a streptococcus, which Schütz and others isolated and cultivated. The virus exists chiefly in the nasal discharge, which, when dried and pulverized in hot stables, may be inhaled, and so convey the disease. It may also be ingested or transmitted in a moist condition. The animals most affected are young

horses from two to five years old; but foals and old horses may be attacked. In old horses suppuration of the lymph glands does not always occur, the disease taking the form of an infectious respiratory catarrh. The period of incubation is four to eight days. Of the horses attacked, only about three per cent. die. Precautions should be taken to isolate affected animals and new purchases. Treatment consists in securing good hygienic conditions for the animal, and the administration of febrifuges and tonics. Disinfection of stables after an outbreak of strangles should be thoroughly carried out.

South African horse sickness is a bacterial disease caused, according to Dr. Edington, by a species of mould (*Ecdemamyces*), which, being ingested along with forage, produces serious alterations in the blood, leading to enormous effusions of serum from the blood-vessels. Three varieties are recognized: (1) paard zeikie, or lung sickness; (2) dikkop, or thick head, in which the head and neck are swollen; and (3) blue tongue, which is probably only a variety of dikkop. Horse sickness has been known in Africa since the year 1780. It is not contagious in the sense of being conveyed directly from one horse to another; but horses that are allowed to graze on dew-laden grass in the early morning, in certain districts, during the sickly season—viz. February, March, and April—often become affected with this disease. The mortality is very high in all forms of horse sickness. When the lungs are affected the death rate is ninety-nine per cent. The period of incubation is about eight days. The symptoms develop suddenly—rise of temperature; shivering; congestion of the lungs, with difficult, rapid breathing; discharge from the nostrils of pale yellow, frothy fluid, often in great quantities. Death takes place in about four days, from suffocation. In dikkop, or thick head, the head and neck are enormously swollen, and the tongue swollen and blue-looking. Post-mortem examination reveals a great effusion of pale yellow fluid in the lungs and chest; some of this fluid is coagulated, and looks like pale yellow jelly. This jelly-like effusion is also noticeable in the swollen head and neck. Death is caused by the multiplication of fungi in the blood, leading to thrombosis of the blood-vessels. Treatment is useless. The safest precautions are to move droves of horses from low-lying districts to the hill country, where the disease does not prevail. Give no grass to stabled horses until it has been dried. During the sickly season

have all horses kept in stables or kraals (where there is no grass) until the dew has disappeared from the veld. Dr. Edington claims considerable success in preventing horse sickness by inoculation. The so-called 'salted' horses are rare, and of doubtful value.

Organic Diseases.—The organs of respiration suffer from catarrh, laryngitis, pneumonia, pleurisy, bronchitis, roaring, whistling, and broken wind. Roaring in horses is an abnormally loud, coarse sound, heard in respiration when the animal is exerted. It is caused by paralysis of the muscles of the larynx, generally affecting those on the left side of the neck. Roaring is believed to be hereditary, and frequently occurs as the result of some other respiratory disease. Whistling is a modification of roaring, due to similar causes. Roaring and whistling may appear suddenly. Broken wind is a nervous affection of the respiratory organs, characterized by loss of elasticity and nervous power in the air cells of the lungs. The symptoms are difficulty in breathing, a double expiratory effort of the abdominal muscles, and a peculiar short, spasmodic cough. Improper feeding is a common cause of broken wind. The digestive organs suffer from a variety of disorders. Colic or spasm of the muscular coat of the intestines is very common, and is generally due to some error in feeding, watering, or management. Flatulent colic is caused by distension of the intestines with gas, the result of acute indigestion. Obstruction of the bowels may be caused by masses of hard, dry food, or by calculi, composed chiefly of phosphates of lime and magnesia. Gastro-enteritis, peritonitis, rupture of the stomach or intestines, twist and intussusception of the bowels are conditions occurring with moderate frequency. The horse exhibits abdominal pain by scraping or pawing with his forefeet; kicking at the abdomen with his hind feet; by lying down, rolling, getting up again, looking round at his sides; and if the pain is acute, by rapid breathing, a distressed expression, violent movements, and profuse perspiration. Diseases of the circulatory organs, such as endocarditis, pericarditis, valvular diseases and dilatation of the heart, aneurism, hæmorrhage, and lymphangitis, are not uncommon in horses. The urinary organs may suffer from nephritis; cystitis; calculi in the kidney, bladder, or urethra; polyuria; hæmaturia; azoturia; retention of urine; and paralysis of the bladder. The generative organs suffer from injuries in parturition, from septic

metritis, abortion, sterility, leucorrhœa, and *maladie de coût*. Diseases of the nervous system, such as megrims, staggers or vertigo, phrenitis (from abscess or tumour in the brain), paralysis (partial and general), stringhalt, and shivering, are often noticed in horses. Megrim or vertigo is characterized by symptoms of giddiness, with shaking of the head, a tendency to fall to one side, and partial loss of consciousness. The term shivering denotes a peculiar spasmodic action of the hind limbs and tail, most noticeable when the animal is backed, and most frequently seen in heavy cart-horses. It is a form of partial paralysis.

Organs of Locomotion.—Lameness is very common in horses, and is due to a great variety of diseased conditions. The feet suffer from pricks in shoeing—i.e. the nail enters the sensitive tissues, and may cause severe inflammation and suppuration inside the hoof. Blood-poisoning and death sometimes follow a prick. A corn in a horse's foot is a blood-stained patch of horn, due to bruising of the sensitive sole by the shoe. Corns are usually found on the inner heels only of the fore feet. Laminitis ('founder'), or inflammation of the sensitive laminae of the fore feet, and sometimes of the hind and fore feet, causes intense lameness and acute pain. Laminitis is produced by errors in diet, fast work when horses are out of condition, and by metastasis from other organs. Long-continued pressure on one foot (as when the other is diseased), and continual standing (as on board ship), may also produce laminitis. Sloughing of the hoofs, chronic lameness with alterations in the shape of the feet, and death, may result from this disease. Navicular disease, thrush, canker, quittor, sand-crack, and contraction of the hoofs are other diseases of the feet which give trouble frequently. Exostoses form on the bones, such as splints, ringbones, and sidebones; fractures and dislocations occur, sprains of muscle and tendon, bursal enlargements; diseases of joints (such as bone spavin and bog spavin), thorough-pin, curbs, and many diseased conditions due to accidental injuries and to wear and tear of the limbs, are extremely common. Malignant and non-malignant tumours, diseases of the eyes and skin, fistulae of the poll and withers, swell the list of diseases to which horse-flesh is heir.

Parasitic Diseases.—The larvae of the gad-fly (*Æstrus equi*) are found attached to the stomach of the horse, and known as 'bots,' while ascarides and other round worms inhabit the intestines. The



Thoroughbred Stallion 'St. Simon,' the property of the Duke of Portland.

Strongylus armatus, a blood-sucking round worm, pierces the blood-vessels of young horses occasionally, and causes anæmia, diarrhoea, wasting, dropsical swellings, and death. Aneurism of large abdominal vessels occasionally occurs, owing to the presence of these parasites within them. Three varieties of mange insects attack the skin of the horse, while ringworm frequently makes its appearance. See *Veterinary Pathology*, by Friedberger and Fröhner (trans. by Captain Hayes; new ed. 1904, etc.); Müller's *Operative Veterinary Surgery* (trans. by Dollar, 1892); *The Principles and Practice of Veterinary Medicine*, by Williams (8th ed. 1897); *The Principles and Practice of Veterinary Surgery*, by Williams (10th ed. 1904); *Parasites and Parasitic Diseases of Domesticated Animals*, by Prof. Neumann (trans. by Dr. Fleming, 1892); Fleming's *Veterinary Obstetrics* (1895; 2nd ed. 1896); Robertson's *Equine Medicine* (1883).

HORSES FOR MILITARY PURPOSES.—The supply of horses for the British army is the duty of the inspector-general of remounts.

(1.) *Supply in Peace.*—Five colonels of cavalry or artillery, accompanied by five veterinary surgeons, are constantly employed in purchasing remounts direct from breeders and traders. The horses must be between rising three to rising seven years old, and 15·2 to 16 hands high. The prices paid vary from £40 to £50, the nation spending in the 1905-6 estimates £162,000 on remounts. They are classified as riding and draught horses, and are usually sent direct to the remount depôts at Woolwich, Dublin, Canterbury, and Arborfield Cross near Wokingham. Horses that are fifteen years of age, and are unfit for service, or are likely to become so in the course of the year, are sold by public auction, and realize an average price of just under £10. About ten per cent. of army horses are replaced every year. Officers buy their own chargers privately, or from the remount depot under certain conditions. Cavalry officers can have one of the troop horses as a charger at a fixed yearly payment, but they are not allowed to hunt or drive such horses. Field artillery officers, and captains and lieutenants of the army service corps, are mounted on horses belonging to the establishment. All mounted officers draw rations for a certain number of horses according to their rank—from eight for a general to one for an infantry major or adjutant.

(2.) *Supply in War.*—By the National Defence Act of 1888, all the horses, vehicles, and transport of the country may be re-

quisitioned by the government. In order, however, to have an efficient and quickly obtainable reserve of suitable horses, a system of registration has been adopted, whereby in peace an owner receives 10s. per annum for each horse; these are inspected yearly. On mobilization, the owner must deliver the number and description of horses he has registered at some place within ten miles of his residence and within forty-eight hours of the receipt of a notice warning him to do so, under a penalty of £50 for every horse deficient. Railway, omnibus, and carrier companies, livery-stable keepers, etc., avail themselves of this system of horse registration to a large extent. On delivery, the sum previously agreed to as the value of the horse is paid by the 'purchasers.'

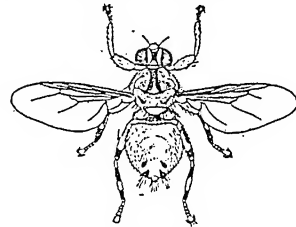
The Care of Horses in the Army.—'Stables' takes place three times a day, as follows: Morning stables, 6 to 7 a.m., under the charge of the officer on duty. Bedding straw removed, horses groomed and fed with 3 lbs. of oats. Midday stables, for one and a half hours after drill, all officers available attending. Horses groomed and fed with hay and 3 lbs. of oats. Evening stables, 5 to 6 p.m., under the officer on duty. Horses groomed, fed with hay and 4 lbs. of oats, and bedded, fresh straw being mixed with the cleaner parts of the old. The horses are watered at least four times a day.

Horse, MASTER OF THE, a great officer of the court, who superintends the royal stables, is official head of the equerries, and master of the servants connected with the stables, controlling also the revenue and expenses of the department. He is responsible for the arrangements of state processions, and rides next the monarch. The actual management of these functions falls on the crown equerry. The official is appointed nominally during the sovereign's pleasure, but the office is really dependent upon the political party in power.

Horse-chestnut (*Æsculus Hippocastanum*) is one of the handsomest of the deciduous trees of Britain, first imported about the beginning of the 17th century. It is a native of Central Asia, and was thence introduced into Turkey in the 16th century. It is a very quick grower. Its leaves are large and fan-shaped, each consisting of five or seven long serrated leaflets. A characteristic feature consists in the large thickened buds and branch-ends. In spring the beautiful erect white cones or spikes of fragrant flowers give the chestnut its name of the giant's nosegay. These are followed by prickly seed chambers, within

which are the characteristic, highly polished, reddish-brown nuts. The popular name of the tree is said to be due to the horse's-foot-like scars which mark the twigs at the points where leaves have fallen. The horse-chestnut is of small economic value. See CHESTNUT.

Horse-fly, or FOREST-FLY (*Hippobosca equina*), a dipterous insect found in woods, notably in the New Forest, England, and attacking horses, whose blood it sucks, the attacks being chiefly made on the under-surface, and in the tail region. The body is about four lines long, and is brownish-yellow. Only one egg is laid at a time, and it is retained within the body until the earlier stages of development are passed through, so that when extruded the egg-case really contains a pupa. From this pupa-case the perfect insect emerges.



Horse-fly.

Horse Guards, a building in Whitehall, London, formerly the departmental headquarters of the commander-in-chief of the British army. The term is used to signify the military administrators of military affairs, as distinguished from the Secretary of State for War, who is the civil head of the army.

Horsehair Worm. See GORDIUS.

Horse Latitudes. The ill-defined tropical belts of high barometric pressure at latitudes 30° N. and S., on the outer margins of the trades, are known as the horse latitudes, or area of tropical calms. The winds in this region are light and variable, and occasionally calm; but, unlike the doldrums, the weather is comparatively clear and bracing.

Horse-mackerel, a name given to the members of the family Carangidae, which includes a large number of fish that are useful as food, and are widely distributed over the oceans of the world. To this family belong the scad or common horse-mackerel, frequent in British waters, the pilot-fish, and many others. The common horse-mackerel (*Caranx trachurus*) reaches a length of nearly two feet, and has the lateral line armed with large vertical plates throughout its length.

Horsens, seapt. tn., Jutland, Denmark, 22 m. s.w. of Aarhus. The old Grey Friars' church has many remarkable monuments, and the prison is the principal house of detention for male convicts in Denmark. The chief industries are weaving, iron-working, and shipbuilding. Pop. (1901) 22,243.

Horse-power. When a force is exerted against a resistance so that motion results, as when a weight is lifted or a spring compressed, work is done to an extent equal to the product of the force into the distance through which it has been exerted, the British unit being the weight of a pound lifted a foot, or 1 foot-pound. The amount of work is independent of the time it takes, but the power of the system exerting it is inversely proportional to this factor—i.e. the shorter the time in which the work is done the greater the power, thus, the British unit, or horse-power, is such a power as can lift 33,000 lbs. 1 ft. in 1 minute. For example, when a man weighing 200 lbs. ascends a flight of stairs 25 ft. high, he does $200 \times 25 = 5000$ ft.-lbs. of work. If he does it in 1 minute, he is working at the rate of

$\frac{5000}{33000} = .15$ H.P.; whereas if he runs up in 12 seconds—i.e. $\frac{1}{5}$ minute—the horse-power he exerts

$= \frac{5 \times 5000}{33000} = .75$. More complex cases are worked out on precisely similar lines. Thus, the indicated horse-power of a steam-engine, or total power the system exerts, is found by measuring the mean effective pressure (p) per sq. in. of piston throughout the stroke by means of the indicator diagram, and multiplying it by the area of piston (a) to get the total force. The product of this quantity into the length of stroke (l) gives the work done, and this, if multiplied by the number of strokes (n) per minute, and divided by 33,000, gives the horse-power, or I.H.P. = $\frac{plan}{33000}$. If the

engine is double acting, there will be a practically equal power exerted simultaneously at the other end of the cylinder, thus doubling the power of the engine.

The brake horse-power is that which a motor can exert in doing outside work, and in the case of a steam-engine is less than the I.H.P. by the power required in the engine to overcome the friction of its parts. It is measured by a Prony brake or transmission dynamometer, in which the force is determined, in the first case, that is required to overcome the friction of a brake, or, in the second, to twist the shaft by which the engine is coupled to

the machines, etc., it is driving. The product of this force into the distance through which the point at which it is applied travels per minute, divided by 33,000, gives the B.H.P.

The power of an electric current is the product of the number of units of current into the difference of potential between the terminals of the apparatus in which it is utilized; and hence the unit of electrical power, or watt, is equal to 1 volt \times 1 ampere.

The following relations between the various units of power are useful:—1 watt = 10^7 ergs per sec., or 7373 ft.-lbs. per sec.; 746 watts = 1 H.P.; and 1 cheval-vapeur = 75 kilogram-metres per sec., or 986 H.P. See also ANIMAL-POWER.

Horse-racing. There were trials of speed and endurance between horses centuries before the Christian era, but the animals were driven in chariots. Homer (*Iliad*, xxiii.) gives a graphic description of such a race. The Greeks set apart certain races to be run by colts, and others by fillies, of the same age. But the sport, as we know it, did not become popular until its rise in Britain during the reign of James I. Newmarket had become a centre for the sport even before that. Epsom, or Banstead Downs, as it was long called, also became the scene of race-meetings. In Queen Anne horse-racing again found a supporter, and she was the first to give royal cups, to be run for at the northern meetings only. Her example was followed by George IV. His brother, the Duke of York, was also devoted to the sport, and kept horses, as did the Duke of Clarence, afterwards William IV. From the death of William IV. until late in the 'eighties, when the Prince of Wales (now Edward VII.) commenced an owner's career, nothing was seen of royalty on the turf.

There appears to have existed no governing body who controlled the destinies of the turf until the year 1758. In Heber's *Historical List of Horse-Matches Run* for that year is the report of the proceedings at a meeting of the Jockey Club, held on March 24. It was then resolved 'that every person who shall ride at Newmarket for plate, sweepstakes, or match, shall be obliged to weigh when he comes in, allowing two pounds above the weight and no more.' It was further resolved 'that every rider who shall neglect to obey this resolution shall be disqualified from riding hereafter at Newmarket, unless any gentleman or his rider shall declare, before starting, that the rider is above the weight allowed of by the aforesaid resolution.'

In the same work is a copy of 'part of an Act of Parliament, passed in the thirteenth year of his late majesty's reign (George II.),' which provided, amongst other things, that 'any person that shall run a horse, mare, or gelding for less value than fifty pounds forfeits the sum of two hundred pounds.' A fine of £100 was provided for whoever might 'print, publish, advertise, or proclaim any money, or other thing, to be run for of less value than fifty pounds.' It was in George III.'s reign that the horse-tax, which imposed a duty of two guineas upon every horse started, was passed. The writer on *Racing* in the Badminton Library states that the Jockey Club was founded in 1750, when the first rules to govern horse-racing were published. In the year 1797, 593 horses of all ages ran in England (not including Ireland), and in 1901 (including Ireland) the number had increased to 4,019, while in 1904 the number had decreased to 3,017. The Jockey Club is a self-constituted body, and possesses no charter; and although the force wielded is moral, it is enough to deprive the evil-doer, upon conviction, of his means of livelihood, either temporarily or permanently. By Rule 65, any horse winning at a meeting not under Jockey Club rules is thenceforward disqualified from running at meetings at which the rules are in force. There are three stewards of this body, the senior of whom retires annually, after nominating his successor, subject to the approval of the members present. The stewards of the Jockey Club are the stewards of all races run at Newmarket, and are also, *ex officio*, stewards of Epsom, Ascot, and Goodwood. At other meetings stewards are appointed by the local executive. The training-grounds at Newmarket were at first leased from the Duke of Rutland at 5s. an acre. After the lease ran out this rental was increased, and eventually became as high as £1 per acre. Admiral Rous, looking to the future, thereupon secured it on a lease of ninety-nine years at 30s. per acre for the Jockey Club.

Although, during the reign of George III., 'give-and-take' plates, with weight given and allowed for horses over or under fourteen hands, figured on most programmes, there are some who maintain that our race-horses have deteriorated, and that this is mainly due to the prevalence of two-year-old racing, and the number of short-distance 'scurries' which occur nowadays. But since 1899 this has been altered, and during the following year there were far more long-distance races run;

whilst a rule came into force to the effect that two-year-olds shall not run for a stake to which more than a certain amount has been added, prior to the first of June. Experts are agreed that it is a fatal policy to 'force' and 'run' young horses without regard to stamina and strength.

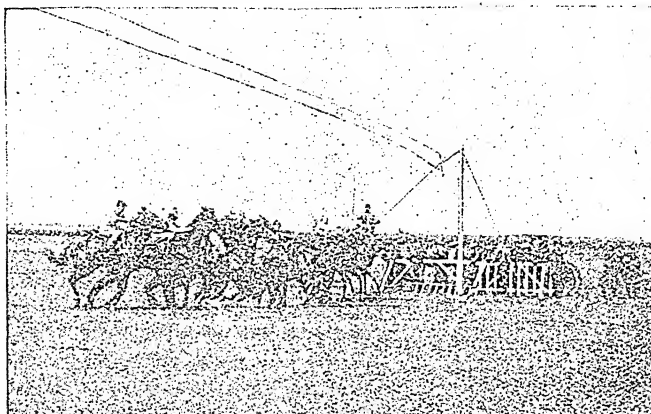
In races confined to two-year-olds, what with penalties for winning, and breeding allowances, there is frequently a difference of 14 lbs. or more between the top and bottom weights, although it may be laid down in the original conditions of the race that colts shall carry 9 st., fillies and geldings 8 st. 11 lbs.; and there is a special 'weight for age scale' laid down in the Rules of Racing, from which it can be readily gathered that the proportion of weight varies with the months of the year. In 'selling races,' the winner is put up to auction after the race, any surplus realized over and above his entered selling-price being divided between the owner of the second horse and the race-fund. Moreover, a horse entered to be sold at a certain price is liable to be claimed by the owner of any horse running in the same race at that price, plus the value of the stake. And it is this clause which prevents owners from undervaluing their animals, and reaping an unfair advantage. At the same time it occasionally happens that a horse valued at £1,000 will be entered to be sold for a much smaller sum. 'Handicaps' succeeded the 'give-and-take' contests of the 18th century; but it was not until 1818 that they figured frequently in race programmes. The main idea of a handicap is that every horse engaged should be weighted so as to possess an equal chance. Rule 52 in the Rules of Racing lays down that the top weight to be allotted in a handicap shall not be less than 9 st., except in a handicap confined to apprentice-ridden horses. If in a handicap for which there is a minor forfeit declared by a fixed time, the highest weight accepting was originally less than 9 st., it shall be raised to that weight, and the other acceptances equally. In all important handicaps there is a day specified for 'declaration of forfeit'—i.e. an owner who is dissatisfied with the weight allotted his horse can, if he strike him out of the race on or before that day, escape all liability save the 'minor forfeit,' which is usually £5. Those owners who 'accept' with their horses incur thereby a further liability, which is increased should the horses face the starter. There are also certain penalties (i.e. increase of weight) laid down for horses who may win subsequent to the pub-

lication of the weights for that particular event. The minimum weight a horse was allowed to carry was, for some years prior to 1860, 4 st.; but shortly after 1860 the Jockey Club ordained that no race-horse should carry a lighter weight than 5 st. 7 lb., an impost which was subsequently raised to 6 st., the present limit.

The winnings of famous race-horses reach large figures. 'Isinglass' is credited with £57,456, 'Donovan' with £56,154, 'Flying Fox' with £40,096, five others with sums of between £30,000 and £40,000, and four other horses with over £25,000. The highest price ever paid for a thoroughbred is 37,500 guineas, the sum given by M. E. Blanc in 1900 for the late Duke of Westminster's 'Flying Fox.' The record price for a two-year-old is 21,000 guineas, given by Mr. G. Faber in 1901 for 'Duke of

lowance in the matter of weight, but certain foreign sportsmen showed us that it is quite possible to breed race-horses in other lands than Great Britain, the blood being, of course, purely British. By far the most successful of these was Count Frederic de Lagrange. The first American animal to gain fame on this side of the Atlantic was a mare named 'Prioress,' the property of Mr. R. Ten Broeck. Mr. Pierre Lorillard was the first American, however, to carry off the English Derby with 'Iroquois,' who was trained by an American, but mostly ridden by an English jockey, Fred Archer having the mount in the Derby and St. Leger. In 1900-1 the forward seat of the American jockey became all the rage.

The 'starting-gate' is an innovation from Australia, and came into general use for all races in 1902. English owners, trainers,



The Australian Starting-gate.

Westminster;' and for a yearling, 10,000 guineas, paid by Mr. R. S. Siovier in 1900 for 'Sceptre.' 'Sceptre' also bears the honour of being the only horse which has won the Two Thousand Guineas, the One Thousand Guineas, the Oaks, and the St. Leger, which it did in 1902. The fastest mile on record by a race-horse in Britain is 1 min. 33½ sec., by 'Caiman' in the Lingfield Park Stakes, 1900. The record time for the Derby is 2 min. 36½ sec., made by Major Loder's 'Spearmint' in 1906. The winners and time in the Derby for the preceding five years were:—'Cicero,' 2 min. 39½ sec. (1905); 'St. Amant,' 2 min. 45½ sec. (1904); 'Rocksand,' 2 min. 42½ sec. (1903); 'Ard Patrick,' 2 min. 42½ sec. (1902); 'Volodyovski,' 2 min. 40½ sec. (1901).

In the early days of Goodwood, horses bred abroad, including 'barbs,' received a substantial al-

lowance in the matter of weight, but certain foreign sportsmen showed us that it is quite possible to breed race-horses in other lands than Great Britain, the blood being, of course, purely British. By far the most successful of these was Count Frederic de Lagrange. The first American animal to gain fame on this side of the Atlantic was a mare named 'Prioress,' the property of Mr. R. Ten Broeck. Mr. Pierre Lorillard was the first American, however, to carry off the English Derby with 'Iroquois,' who was trained by an American, but mostly ridden by an English jockey, Fred Archer having the mount in the Derby and St. Leger. In 1900-1 the forward seat of the American jockey became all the rage. The 'starting-gate' is an innovation from Australia, and came into general use for all races in 1902. English owners, trainers,

Calendar (annually); *Ruff's Guide to the Turf* (annually). See also RACE MEETINGS, STEEPLECHASING, POINT TO POINT STEEPLECHASING, and STUD BOOK.

Horse-radish (*Cochlearia Armoracia*), a cruciferous plant which has been cultivated in English gardens for over three hundred years as a condiment, especially with roast beef. The root, which has a hot, piquant, mustard-like taste, is served in thin slices with the joint.

Horse-shoe Fall. See NIAGARA FALLS.

Horse-shoeing. See FARRIERY.

Horsforth. vil., 5 m. N.W. of Leeds, W. Yorkshire, England. Industries: woollen goods, quarries of millstone grit and Yorkshire stone. Pop. (1901) 7,785.

Horsham. mrkt. tn., Sussex, England, on Arun R., 18 m. N.W. of Brighton. The old church of St. Mary contains monuments of the Shelley family. Brewing, tanning, iron and brass founding, and coach-building are the chief industries. At West Horsham, 3 m. S.W., is Christ's Hospital, removed from London in 1902. Pop. (1901) 9,446.

Horsley, JOHN CALCOTT (1817-1903), English painter, born at Brompton, London; first exhibited at the Royal Academy in 1836; painted frescoes for the Houses of Parliament (1845-8); was elected R.A. 1856, and held the treasurership of the same from 1882-97. His principal pictures are *Rent Day at Haddon Hall*, *The Chess Players*, *Youth and Age*, *Under the Mistletoe*, *Caught Napping*, *Life at Fontainebleau*, *A Merry Chase in Haddon Hall*, *Wedding Rings*, and *The Healing Mercies of Christ*, an altar-piece in chapel of St. Thomas's Hospital, London. See his autobiographical *Recollections of a Royal Academician*, ed. Mrs. Helps (1903).

Horsley, SAMUEL (1733-1806), English prelate, born in London, and engaged in controversy with Priestley and with Sir Joseph Banks, the president, over the management of the Royal Society, of which Horsley was secretary. Having edited Newton's works (1785), he became bishop of St. David's (1788), was translated to Rochester (1793), and made dean of Westminster, and then bishop of St. Asaph's (1802). He was author of astronomical, polemical, and critical works (ed. 6 vols. 1845).

Horsley, SIR VICTOR ALEXANDER HADEN (1857), English surgeon and neurologist, born at Kensington, London. He was made professor of Brown Institution (1884-90); secretary to the

Royal Commission on Hydrophobia in 1885; surgeon to the National Hospital for Paralysis and Epilepsy (1886); Fullerian professor at the Royal Institution (1891-3); and professor of pathology at University College, London (1893-6). The results of his researches in cerebral localization are of the greatest value. He has been the leader of a medical movement against the use of alcohol. Among his numerous works are *Brain Surgery* (1887); *Hydrophobia and its Treatment* (1888); and *Experiments upon the Functions of the Cerebral Cortex* (1885).

Hort, FENTON JOHN ANTHONY (1828-92), British scholar and divine, born at Dublin. He devoted his life to the critical study of the New Testament, and edited with his friend Westcott the new version from the Greek. He was elected Hulsean professor of divinity at Cambridge (1878), and Lady Margaret reader in divinity (1887). See *Life and Letters*, by his son, Sir A. F. Hort (1896).

Horta, chief tn., isl. of Fayal, in the Azores. Pop. (1900) 6,734. It also gives name to an administrative district embracing the islands of Fayal, Flores, Pico, and Corvo, with an area of 304 sq. m. and a pop. (1900) of 55,456. See AZORES.

Horten, seapt., co. Jarlsberg, Norway, on W. shore of Christiania Fiord, 8 m. N. of Tonsberg; is the naval arsenal of Norway. Pop. (1900) 8,460.

Hortense, EUGÉNIE BEAUHARNAIS (1783-1837), queen of Holland, daughter of Josephine Beauharnais by her first husband, was born in Paris. She married (1802) Napoleon's brother, Louis Bonaparte, king of Holland, and on the downfall of the dynasty (1815) fled to Switzerland. The youngest of her sons became Napoleon III. See Fourmestaux's *La Reine Hortense* (1864).

Hortensius, QUINTUS (114-50 B.C.), was perhaps, after Cicero, the most famous orator of ancient Rome. He belonged to the aristocratic party, and supported Sulla in the civil wars, and in later life found scope for his talent chiefly in defending aristocrats when on their trial for misgovernment or other offences. He was quaestor in 81, aedile in 75, praetor in 72, and consul in 69 B.C.

Horticultural Education. The education committee of nearly every county now provides expert lecturers and demonstrators in gardening, and these teachers are almost always practical men of considerable experience. Among those colleges which make a special feature of

horticultural education are the Lady Warwick College at Studley Castle in Warwickshire, and the Horticultural College at Swanley in Kent. The Royal Horticultural Society (Vincent Square, Westminster) conducts an examination in the principles of horticulture, and awards medals.

Horticulture. See GARDENING.

Horton, ROBERT FORMAN (1855), English Congregational minister, born in London. He was lecturer in history at Oxford; lecturer at Yale College, U.S.A. (1893); and chairman of the Congregational Union of England and Wales (1903). He is author of *Inspiration and the Bible* (1888), *The Book of Proverbs* (1891), *Revelation and the Bible* (1892), *The Teaching of Jesus* (1895; new ed. 1905), *The Apostles' Creed* (1895), *The Commandments of Jesus* (1898; new ed. 1905), *The Pastoral Epistles* (1901), *The Trinity* (1901), *The Open Secret* (1904), and *The Hidden God* (sermons, 1905).

Horus, in ancient Egyptian mythology, was the sun-god, identified with the Greek Apollo, and with Harpocrates, the last and weakly child of Osiris. He was represented as a youth, and is said to have been born with his finger on his lips, as a sign of secrecy and mystery. At Rome he was worshipped as a god of quiet life and silence, but there was much mysticism in his worship, on which account the senate temporarily suppressed it. The later mystical Greek philosophers, such as Porphyrius and Iamblichus, made much use of his divinity in their mystic speculations.

Horvát-Szlavonország. See CROATIA-SLAVONIA.

Horváth, MIHÁLY (1809-78), Hungarian historian and statesman, was born at Szentes (co. Csongrad), and became bishop of Csanád (1848). He was minister of public worship and instruction under Kossuth; but when the nationalist movement was crushed he went into exile, and only returned to Hungary in 1867. He then devoted his energies chiefly to the writing of history, and produced a *General History of Hungary until 1823* (3rd ed. 1873; German abridged trans. 1851-5); *Twenty-five Years of a Hungarian History, 1823-48* (2nd ed. 1868); and *History of the Hungarian Revolution of 1848-9* (3rd ed. 1898).

Horwich, tn., 6 m. N.W. of Bolton, Lancashire, England; the industries are engineering, bleaching, cotton-spinning, stone quarries, brick and tile works, coal pits. Pop. (1901) 15,083.

APPENDIX OF PRONUNCIATION.

I. GENERAL SCHEME.

In the system of transliteration here adopted the following points are to be carefully noted. Our main object being to give an approximately correct idea of the actual pronunciation of difficult English and foreign words, *the scheme is purely phonetic*. But perfect accuracy being impossible, no attempt is made to reproduce all the more subtle sound distinctions which make elaborate phonetic treatises so deterrent, and would here defeat their own purpose by overburdening the text with endless diacritical marks and bewildering the ordinary reader. Note that of classic names both the English and foreign pronunciations are given; thus—*Acis*=a'sis or a'kis.

In general all the *unmarked* vowels are to be taken as short. Thus—

a = a in fat.
e = e in met.
i = i in fit.
o = o in not.
u = u in but.

So also the few short diphthongs that may be needed—

au = ou in pound.
oi = oy in boy.

All *long* vowels and diphthongs, except the conventional oo, where no mark is needed, are *marked*, as under—

ā = a in fate.
ā = a in far.
ā = a in fall, or a in awe.
ē = e in me.
ī = i in mine, or ai in aisle.
ō = o in mote.
oo = oo in moon, or u in put.
ū = u in mute, or ew in few; also French u.

Consonants are normally as in English. Special points are:—

c discarded, being = either to s in sit or k in cat.
ch in classic names = k or kh, as in Chaos, Chares; elsewhere as ch in chin, or as Keltic ch in loch.
dh = th in then.
g = g in give, go: always hard.
j = j in joy.
q discarded, being with u, which always follows it = kw.
th = th in thin.
w = w in wet: is never a vowel.
x discarded, being = ks or gs.
y = y in you: is never a vowel.
z = z in zeal.
zh = s in treasure.

Special Values (mostly makeshifts).

' = Semitic ain (Arabic and Hebrew), as in 'abd, slave.
' = e mute (Hebrew and French), as in yab'dūl, d'la (de la).

' separates the aspirate in the aspirated letters of Hindi, Urdu, and the other neo-Sanskritic languages. Thus—

bhag, p'hal, t'hop, g'har, ch'har, etc.
gh = ghain (Arabic), as in gharb, the west.
e = French eu, ei, œu.
ch = Keltic and German ch, as in loch.
ñ = nasal n (French, Portuguese, Arabic, etc.), as in mon, nação, fauran, etc.
ly = palatal l in William; French ll in volaille; Italian gl in egli.
ny = French and Italian gn in seigneur, signore; Spanish ñ and Portuguese nh, as in señor, senhor.
h = strong Semitic (Hebrew and Arabic) h, as in bahr, sea, river.
' = stress, as in pre'sent, pre-sent'.

II. EUROPEAN ORTHOGRAPHIC SYSTEMS.

In all the cultivated European tongues the written systems are based mainly on the Latin and, in a few instances, on the Greek alphabet, both of which have been adapted with more or less success to the several phonologies. Most of these tongues having a common Aryan origin, although belonging to different branches—Hellenic, Italic, Teutonic, Keltic, and Letto-Slavic—their phonetisms correspond in a general way, so that the greater part of the original letters have been adopted without any change. Thus all the vowels and diphthongs, both long and short, are generally as in the former pronunciation of Latin, and as still pronounced in its eldest daughter, Italian:—

a = a in far, almost everywhere.
e = a in rare (open), or a in favour (shut).
i = i in fit (short), or i in machine (long).
o = o in hope (open), or o in for (shut).
u = u in rule.

Of the consonants, b, d, f, l, m, n, p, q, r, t, v are nearly everywhere as in English, which has here remained more faithful to the old Teutonic (Gothic), and to some extent even to the organic Aryan, than most of its congeners. Hence, in most phonetic schemes the rule is to take the Italian vowels and the English consonants as normal.

All other shiftings and devices which the European tongues have had recourse to in order to express sounds not provided for in the Greek and Latin alphabets will now be explained.

ITALIAN.

c = k before a, o, u—cane = kā'nā; = ch before e, i—cena = chā'nā. ch = k; chi, che = ki, kā—chiesa = ki-ā'sa. g = g before a, o, u—gatto = gat'to; = j before e, i—genio = jā'ni-o. gh = g—ghianda = gi-ān'da. gu = gw—guerra = gwer'ra. gl in open syllables = ly—egli = ē-lyi; in closed syllables = gl—negligenza = nā-gli-jen'tsa. gn = ny—Bologna = bō-lō'nyā. h is silent and little used except in combination with c and g as above. j final = i or ii—studj = stoo'di, or stoo'di-i; elsewhere = semi-vowel y—

Appendix of Pronunciation.

gioja = jō'ya. *qu* = kw—*quando* = kwān'do. *s* initial and before another consonant = s—*sono* = sō'nō; elsewhere mostly = z—*pacse* = pā-ā'zā; but also pā-ā'sā. *sc* = sk before a, o, u—*scogliā* = skō'lyā; *sh* before e, i—*sciniā* = shē'mi-ā. *sch* = sk—*schiaivo* = ski-ā'vo. *z* = ds, ts, or z; as an initial, frequently the former—*zoppo* = tsop'po; *zelo* = zā'lō. The same rule applies to *zz*. Double consonants are pronounced separately, as *latte* = lat'tā. *k*, *x*, *y*, *w* are not used.

Accent—grave only is in use; falls on all the vowels, which are then uttered with a strong stress: *città*, *è*, *dì*, *darò*, *giù*.

Examples as here given need not be repeated, as these will suffice to show how the general indications are to be applied.

FRENCH.

a = ā. *ai* = ā. *au* = ō. *e* (when not mute) = ā. *ei* = ā. *eu*, *cei*, and *œu* somewhat like *e* in her. *i* = i and ē. *o* = o and ō. *oi* = wā. *u* = ū nearly. All vowels may be nasalized.

c = k before a, o, u; = s before e, i. *ç* = s. *ch* = sh normally. *g* = g before a, o, u; = zh before e, i. *gn* = gn Italian. *gu* = g (the u being generally mute). *h* absolutely silent. *j* = zh. *ll* = gl Italian, but fainter. *qu* = k usually, but = k before e, i. *r* final, generally mute; elsewhere = r, but more trilled. *s* final mute; elsewhere = s and z, as in English. *th* = t. *ti* often = si. *x* = ks and gs normally; between vowels = s or z—cf. *Bruzelles*, *Auxerre* (s), *dixième* (z); *x* final (when not mute) = z. *y* semi-vowel = y; vowel = i and ē. *z* = z normally, but *Metz* = mās.

Accents—acute (´), grave (`), circumflex (^).

SPANISH.

Vowels mainly as in Italian. When stressed, all may take the acute accent; none other is in use.

b = b. *c* = k before a, o, u; = th before e, i. *ch* = ch. *cu* = kw before a, o, u; = coo before e, i, o. *d* = d, but in some provinces almost = dh. *g* = g before a, o, u; = h (guttural) before e, i. *h* always mute. *j* = h (guttural). *ll* = ly. *ñ* = gn Italian. *qu* = k before e, i; elsewhere not used. *gua* = gwā, sometimes nearly w; *gue* = gā; *gui* = gi. *s* is always sharp.

There are no double letters except *ll* and *rr*, hence *pasion*, *gramática*, etc.

Of all European systems Spanish is the most purely phonetic, all letters being distinctly uttered with one invariable sound.

ROUMANIAN.

Vowels mainly as in Italian, but initial *e* = ye in yet, and *i* nearly = French *u* in un.

c = k before a, o, u; = ch before e, i. *d* = z. *g* = g before a, o, u; = j before e, i. *h* = ch in loch. *j* = zh. *ș* = sh. *ț* = ts. *x* = ks. *y* = i. *z* = z.

GERMAN.

a = ā; *ä* = ā; *ai* = i; *au* = ou; *äu* = oy in joy. *e* = e; *ei* = i. *i* = i and ē; *ie* = ē. *o* = o and ō; *ö* = e in her, but longer. *u* = oo; *ü* = French *u*. *y* = ö.

c = k before a, o, u; = ts before ä, ø, i. *ch* = ch in loch. *chs* = x. *g* = g generally. *h* = h. *j* initial = y. *qu* = kw nearly. *s* initial = z; elsewhere = s. *ss* = s. *th* = t, and now so written—*tun* = thun. *tsch* = ch. *dsch* = j. *sch* = sh. *v* = f. *w* = v. *z* = ts.

DUTCH.

aa = ā. *ee* = ā. *oo* = ō; *oe* = ou; *ou* = ou. *ui* = oi. *eu* = French *eu*. *uu* = oo, *u* = ū. *ei* and *ij* (in some provinces *y*) = i. The consonants are as a rule pronounced as in English. *g* is a strong guttural. *sch* = sk (k guttural). *tj* = ch. *w* as in English, but a little softer. *j* = y.

DANISH.

a = a and ä; *aa* and *â* = ō. *e* and *ee* = e and ā. *i* = i and ē. *o* = o; *ø* and *ö* = German *ö*. *u* = oo. *æ* = a close e, like the French *é*. *y* = French *u*.

c = k before a, o, u; = s before the other vowels. *ch* = k. *d* and *dd* = dh after a vowel or between two vowels. *g* = g. *h* = h. *j* = y. *qv* = kv. *w* not in use. *x* initial = z nearly; elsewhere = ks, gs. *z* = z, dz, and ts. *k* before weak vowels (kj in Norway) = ch. *sk* or *skj* = sh.

Note:—b, d, g, and v (when not initial) are so soft as to be scarcely audible in some districts.

Standard NORWEGIAN is about the same as Danish, allowing for local differences.

SWEDISH.

a, *i*, *u* as in Italian; *ä* = ō; *å* = ā. *e* = e and ā. *o* = o, ō, and sometimes oo nearly; *ö* = e in her, but longer.

c = k before a, o, u, ä; = s before other vowels. *dt* = t. *nd* final = n nearly. *dj* = y. *f* final = v; elsewhere = f, but often mute. *g* = g generally; before e, i, ä, ö, and after l and r, = y; = k before t; is mute before j—*gjordt* = yort. *h* = h, but is mute before j and v. *j* = y. *k* = k generally, but often = y, and before e, i, ä, ö = ch. *qv* = kv. *s* = s, but *stj*, *sj*, and *skj* = sh. *sk* = sh before e, i, ä, ö. *tj* = ch. *v* = v. *x* = ks. *z* = s.

BOHEMIAN (CHEKH).

a = a; *á* = ā. *e* = e; *é* = ā; *ě* = ye in yet; *ey* = ā. *i* = i; *í* = ē. *o* = o; *ó* = ō; *ou* = o-oo. *u* = oo; *ú* and *ů* = oo. *y* = French *u*.

c = ts, even before k—*necky* = nets'kū; *č* = ch. *ch* = ch in loch. *d* before i, f = dy. *g* = g. *h* = h; but *h* final = ch in loch nearly. *j* = y. *š* and *ś* = sh. *t* before i, f = ty. *z* = z. *ž* = zh.

POLISH.

a, *e*, *i*, *o*, *u*, *ü* as in German. *ą* and *ę* are nasals (an, en). *é* = i-ā. *y* = French *u*.

b = by, and other accented consonants are similarly palatalized with inherent *y*. *c* = ts; *cz* = ch; *ch* = k or kh. *dz* = dz; *dź* = j. *h* (rare) = German *ch*. *j* = y. *ł* = gl Italian. *rz* = rzh. *sz* = sh. *w* = v. *z* = z; *ż* = zh.

SERVIAN, DALMATIAN, AND CROATIAN.

a, *o*, *u*, *i*, *e* as in German. *ě* or *ie* = ye in 'yes; follows all consonants except the gutturals.

c and *cz* = ts. *č* and *ch* = ts nearly. *č* and *cs* = j. *dj*, *dy*, *gj*, and *gy* = j nearly. *g* = g. *h* = h. *j* = y. *lj* and *ly* = gl Italian. *nj* and *ny* = gn Italian. *s*, *ss*, and *sz* = s; *š* and *so* = sh, and so written in Slavonia. *z* = z. *ž* and *x* = zh. *dz*, *dx*, *cx*, *ds* = j.

Note:—*r* as a consonant = r, but *r* as a vowel is = er very faintly uttered. It is variously written *er*, *är* (in Dalmatia), *r* and *r* (in Servia and Croatia).

HUNGARIAN.

a, *e*, *i*, *o*, *ö*, *u*, *ü* as in German, only a sounds somewhat like o; all are lengthened with the acute accent—*á*, *é*, etc.

cs = ch; *cz* = ts. *gy* = di in French *Dieu*. *j* = y. *ly* = gl Italian, but much softer, the l barely heard. *ny* = gn Italian. *s* = sh; *sz* = s. *ty* = ti in French *métier* (*tyuk* = ty-ook). *v* = v. *z* = z. *zs* = j.

Note:—*cs* and *cz* are now often written *ts*, *tz*. *y* has no independent sound, but blends with the antecedent consonants l, n, etc. *c*, *ch*, *q*, *w*, and *x* are wanting, except in foreign words—*Cato*, *Achilles*, etc.

VOLUME V.—Franc to Horwich.

- Franc, frän.
 Francesca da Rimini, fran-ches'ka da ri'mi-ni.
 Francesco di Paula, fran-ches'ko di pou'la.
 Franceville, fräns-vël'.
 Franche-Comté, fränsh-kon-tä'.
 Francia (Francesco Raibolini), fran'cha (fran-ches'-ko ri-bo-lé'ni).
 Francia, José Gaspar Rodríguez da, fran'thi-a, ho zä gas'par ro-dre'gez da.
 Francillon, fran-sil'yön (originally fran-si-yön').
 Francke, fran'ka.
 Frances-tireurs, fran-tê-rer'.
 Frangipant, fran-ji-pä'ni.
 Frank-almoigne, frank-al-mwain'.
 Frankenhausen, frank-en-hou'zen.
 Frankenstein, frank'en-stin.
 Frankenthal, frank'en-täl.
 Frankonwald, frank'en-vald or frank'en-valt.
 Frankl, frank'l.
 Fransche Hoek, frans-kä-hook'.
 Franz, frants.
 Franzen, fran'tsen.
 Franzensbad, fran'tsens-bäd or fran'tsens-bät.
 Franzensfeste, fran'tsens-fest-ta'.
 Franz-Joseph, frants-yö'sef.
 Franzos, fran-tsöz'.
 Frapan, Isle, fra-pan', il'sa.
 Frascati, fras-kä'ti.
 Fratercula, frät-er-kü-la or frä-ter'koo-la.
 Fraticelli, fra-ti-chel'li.
 Prattamaggiore, frat-ta-ma-jö'ra.
 Frauenfeld, frou'en-felt.
 Frauenlob, frou'en-löb.
 Frauenthofer, frou'en-höf-er.
 Fraustadt, frou'stat.
 Fraxinus, frak'si-noos or fraks'in-us.
 Fray Bentos, fri-ben'tös.
 Fréchette, frä-shet'.
 Fredegond (Fredegunde), fred'ä-gond (fred'ä-goön'-da).
 Fredericia, fred-er-i'si-a.
 Frederikshavn, fred'er-iks-ha-v'n.
 Fredrikstad, fred'rik-stat.
 Fredonia, frä-dö'ni-a.
 Freesia, frë'si-a.
 Fregenal de la Sierra, frä-hen-al' dä la si-er'ra.
 Freiberg, fri'berg.
 Freiburg-im-Breisgau, fri'-boorg-im-bris'gau.
 Freienwalde, fri'en-val-da.
 Freiligrath, fri'lig-rät.
 Freischütz, fri'shüts.
 Freising, fri'zing.
 Freistadt, fri'stat'.
 Fréjus, frä-zhüs'.
 Frelinghuysen, frë'ling-hoi-zen.
 Frémlet, frä-mi-ä'.
 Fremmet, frä-mi-nä'.
 Frère, frër.
 Frère-Orban, frär-or-bay'.
 Fréron, frä-ron'.
 Frescobaldi, Girolamo, fres-ko-bal'di, ji-rö'la-mo.
 Frese, Jakob, frä'sä, ya-köb'.
 Fresnel, frä-nel'.
 Fresnillo, fräs-në'lyo.
 Freund, frent.
 Freycinet, frä-si-nä'.
 Freycinetia, fri-sin-ä'sha.
 Freyja, fri'ya or frä'ya.
 Freyr, fri'r or frär.
 Freytag, fri'täg.
 Fribourg (Freiburg), frë'-boorg (fri'boorg).
 Frideswide (Fredeswitha), frë'dä-swë'dä (frä'dä-swë-dha).
 Friedek, frë'dek.
 Friedland, frëd'land.
 Friedrichroda, frëd'rich-rö-da.
 Friedrichshafen, frëd'richshä-fen.
 Friedrichshagen, frëd'richshä-gen.
 Friedrichsruhe, frëd'richs-roo-ha.
 Friedrichsthal, frëd'richstäl.
 Friedrich von Hausen, frëd'rich fon hou'zen.
 Friedrich-Wilhelmshafen, frëd'rich -vil-helmz'hä-fen.
 Fries, frës.
 Fringillidae, frin-jil'i-dë.
 Fritsch, frich.
 Fritzner, frits'ner.
 Friuli, frë'oo-li.
 Froben (Frobenius), frö'-ben (frö-bä'ni-oos).
 Froebel, frë'bel.
 Frohschammer, frösh'ham-mer.
 Frohsdorf, fröz'dorf.
 Froissart, frwä'sar'.
 Fromentin, frö-nian-tan'.
 Frontenac, frön-t'nak'.
 Frontinus, fron-të-noos or fron-tin'us.
 Frosinone, frö-si-nö'nä.
 Froude, frood.
 Fructidor, fruk'tid-ör.
 Frugivora, froo-jiv'ör-a.
 Frugoni, froo-gö'ni.
 Frumentius, froo-men'ti-oos or from-en'si-us.
 Frundsberg, froondz'berg.
 Fryxell, frëk'sel.
 Fuca, Juan de, foo'ka, hu-an' dä.
 Fucecchio, foo-chä'ki-o.
 Fu-chien, foo-chi'n'.
 Fu-chou-fu, foo-chou-foo'.
 Fuchsin, fook'sin.
 Fucino, foo-chë'nö.
 Fuchs, fooks.
 Fucus, fū'kus.
 Fueglians, foo-ë'janz.
 Fuego, Tierra del, foo-ä'gö, ti-er'a del.
 Fuente-Álamo, foo-en'tä-ü-lä'mö.
 Fuente de Cantos, foo-en'tä dä kan'tös.
 Fuente Ovejuna, foo-en'tä ö-vä-hoo'na.
 Fuerterrabia, foo-ent-er-rä'bi-a.
 Fuentes de Oñoro, foo-en'täz dä ö-nyö'ro.
 Fuero, foo-ä'rö.
 Fuerteventura, foo-er-te-ven-too'ra.
 Fugger, foog'er.
 Fuh-shan, foo-shän'.
 Fuji-san (Fuji-yama), foo-ji-san' (foo-ji-yä'ma).
 Fu-kien, foo-ki'n'.
 Fukui, foo-koo'i.
 Fukuoka, foo-koo-ö'ka.
 Fukushima, foo-koo-shë'-ma.
 Fukuyama, foo-koo-yä'ma.
 Fulgoridae, ful-gor'i-dë.
 Fulgurites, ful'gur-its.
 Fulica, fool'ik-a.
 Fulnek, fool'nek.
 Fumay, fū-mä'.
 Fumitory (Fumarla), fūm'-it-ör-i (fūm-är'i-a).
 Funabashi, foo-na-bä'shi.
 Funchal, foon-shal'.
 Fünen, fū'nen.
 Fünfhaus, fūnf'hous.
 Fünfkirchen, fūnf'kër-chen.
 Fung-hwang, foong-hwang'.
 Funiculus, fūn-ik'ul-us.
 Furcræa, fur'krë-a.
 Furfurane, fur'fur-än.
 Furka, foor'ka.
 Furlo, foor'lö.
 Furneaux, fūr-nö'.
 Furnes, fern.
 Furruckabad, fur-ruk-ä-bäd'.
 Fürstenbund, fūrst'en-boont.
 Fürstenwalde, fūrst'en-val-da.
 Fürth, fūrt.
 Fusagasuga, foo-sa-ga-soo-ga'.
 Fusan, foo-san'.
 Fuscaldo, foos-cäl'dö.
 Fushiki, foo-shë'ki.
 Fushimi, foo-shë'mi.
 Fustel de Coulanges, füs-tel-d'koo-länj'.
 Fusulina, füs-ul-in'a.
 Fusus, füs'us.
 Futa-Jallon, foo'ta-jal'lon.
 Futa-Toro, foo'ta-tö'ro.
 Fuzuli, foo'zoo-li.
 Fyzabad, fiz-ä-bäd'.
 Gabacho, ga-bä'chö.
 Gabelentz, gü'b'l-ents.
 Gabelsberger, gü'belz-ber-ger.
 Gaberlunzie, gäb'er-lun-zi.
 Gaberones, gäb'er-önz.
 Gabil, gü'bi-i or gäb'i-i.
 Gabinius, gä-bë'ni-oos or gab-in'i-us.
 Gablonz, gä'blonts.
 Gaboriau, ga-bö-ri-ö'.
 Gabrovo, ga-brö'vö.
 Gachard, gä-shar'.
 Gadames, gha-dä'mes or ga-da-mi'.
 Gade, gü'da.
 Gaddis, gad'i-dë.
 Gæa (Ge), gë'a (gë).
 Gärtnera, gärt'ner-a.
 Gasta, gä-ä'ta.
 Gattulia, gä-too'li-a or jët-ool'i-a.
 Gagera, gä'gern.
 Gahanbars, gä-han-bär'.
 Gaia, Villa Nova de, gi'a, vil'la nö'va dä.
 Gaillac, gä-yak'.
 Gaillardia, gä-lyar'di-a.
 Gaimar, gä-mär'.
 Gainesville, gänz'vil.
 Galus, gü'yoos or gi'us.
 Gaj, Ljudevit, gi, lyoo'de-vit.
 Galactodendron, gal-ak-tö-den'dron.
 Galago, gal-äg'ö.
 Galathea, gal-ath-ë'a.
 Galatz, gä'lats.
 Galax, gal'aks.
 Galaxia, gal-aks'i-a.
 Galbanum, gal'ban-um.
 Galeandra, gal-i-an'dra.
 Galega, gal-ëg'a.
 Galeodes, gal-i-öd'ëz.

Appendix of Pronunciation.

- Galeopithecus, gal-i-o-pith-ek'us.
 Galeopsis, gal-i-op'sis.
 Galeotto Principe, ga-lä-ot'to prin'chi-pä.
 Galgacus, gal'ga-kus.
 Galiani, ga-li-ä'ni.
 Galicia, ga-lish'i-a.
 Galignani, ga-li-nyä'ni.
 Galilei, Galileo, ga-li-lä'i, ga-li-lä'ö.
 Galipea, gal-ip-ä'a.
 Galitzin, gal-lits'ën.
 Gallait, gä-yä'.
 Galland, gä-yän'.
 Gallarate, gal-la-rä'tä.
 Gallaudet, gal-lo-det'.
 Galle (port), gäl.
 Galle (person), gal'lä.
 Gallego, gä-lyä'gö.
 Galliard, gä-yär'.
 Galliate, gal-li-ä'tä.
 Gallieni, gä-yä-ni'.
 Gallienus, gal-li-ën'us.
 Galliffet, gäl-li-fä'.
 Gallipoli, gal-lip'ö-li.
 Galluzzo, gal-loo'tsö.
 Galphimia, gal-fem'i-a.
 Galtee, gal-té'.
 Galvani, gal-vä'ni.
 Galvez de Montalvo, gal'-veth dä mont-al'vö.
 Gandak, gun-duk'.
 Gandamak, gun-dä-muk'.
 Gandersheim, gan'derz-him.
 Gandharvas, gänd'har-vus.
 Ganesha (Gana-Pati), gun-ä'sha (gun-a-pä'ti orgun'-pä-ti).
 Gangi, gan'ji.
 Gangpur, gang-poor'.
 Gangue, gang'.
 Ganjah, gun-jä'.
 Ganjam, gun-jäm'.
 Gannat, gän-nä'.
 Gantur, gun-toor'.
 Ganymedes, gan-i-mäd'ez.
 Gapes, gäps.
 Garabit, gä-rä-bé'.
 Garamantes, ga-ra-man'täz.
 Garancin, gar-an-sin.
 Garat, gä-rä'.
 Garcia, gär'thi-a.
 Garcin de Tassy, gär-san'-d'ä-tas-si'.
 Garcinia, gar-sin'i-a.
 Gard, gär'.
 Garda, gär'dä.
 Gardariki, gar-da-ré'ki.
 Gardelegen, gar'dä-lä-gen.
 Gardenia, gar-dén'i-a.
 Gardone Riviera, gar-dö'-nä ri-vi-ä'ra.
 Gardoquia, gar-dö'kwi-a.
 Garhwal, gur-hwal'.
 Garigliano, ga-ri-lyä'nö.
 Garnier, gär-ni-ä'.
 Garnierite, gar'nér-it.
 Garonne, gä-ron'.
 Garrucha, ga-roo'cha.
 Garua, gä-roo-a.
 Gasparin, gäs-pä-ran'.
- Gaspé, gas-pä'.
 Gassendi, gäs-sen'di or gä-san'di'.
 Gastein, gä'stän.
 Gasteria, gas-tér'i-a.
 Gastrectomy, gas-trek'tö-mi.
 Gastrochæna, gas-trö-ké'-na.
 Gastrolobium, gas-trö-löb'-i-um.
 Gastrotomy, gas-trö'tö-mi.
 Gastrula, gas-trü-la.
 Gata, gä'tä.
 Gatchina, gat-ché'na.
 Gauchos, gou'chöz.
 Gaudeamus, gou-dä-ä'moos.
 Gaudichaudia, gon-di-chou'di-a.
 Gaugamela, ga-ga-mä'la or goug-am-äl'a.
 Gaultheria, gal-thér'i-a.
 Gautier, gö-ti-ä'.
 Gavarni, gä-vär-ni'.
 Gavarnie, gä-vär-ni'.
 Gavazzi, ga-va'tsi.
 Gavial, gä-vi-äl.
 Gavotte, ga-vot'.
 Gawilgarh, gou-il-gur'.
 Gayal, giäl.
 Gayangos, gä-yan-hös.
 Gay-Lussac, gä-lüs-äk'.
 Gaylussacia, gä-loos-ä'sha.
 Gazania, gaz-än'i-a.
 Gaz-Kul, gaz-kool'.
 Géant, Col du, zhä'an, köl-dü.
 Geber, jä'ber.
 Gebhardt, geb'hart.
 Gebweiler, gäb-vil-er.
 Gedrosia, ged-rö'si-a.
 Geefs, gäfs.
 Geelong, gö-long'.
 Geolvink, gäl-vink.
 Geestmünde, gäs-te-mun'-dä.
 Geez, gäz.
 Geffe, yev'la.
 Gegenbaur, gä'gen-bour.
 Geibel, gi'bel.
 Geiger, gi'ger.
 Geijer, gä-yer.
 Geikie, gä'ki.
 Geiler von Kaisersberg, gi'ler fon ki'zerz-berg.
 Geislingen, gis'ling-en.
 Geissler, gis'ler.
 Geissomeria, gis-ö-mér'i-a.
 Geissorhiza, gis-ö-ridz'a.
 Gela, gäl'a.
 Gelasimus, gel-as'im-us.
 Gelasius, ge-lä'si-oos or gel-äs'i-us.
 Geldern, geld'ern.
 Gellius, gel'i-oos.
 Gellivara, yel'li-vä-ra.
 Gelnhausen, geln'hau-zen.
 Gelsemium nitidum, gel-sém'i-um nit'id-um.
 Gelsenkirchen, gel-sen-kérch'en.
 Geltru, hel'troo.
 Genappe, zhen-ap'.
- Gendarmes, zhan-darm'.
 Genesius, ge-nä'si-oos or gen-äs'i-us.
 Genette, jen-el'.
 Geneviève, zh'-n'-vi-äv'.
 Genipap, jen'ip-ap.
 Genista, jen'is-tä.
 Genlis, zhan-lé'.
 Genoa (Genova), jen-ö'a or je'nö-a (je'nö-va).
 Genre, zhän'r'.
 Gensan (Gonsan), gen-san' (gon-san').
 Genseric, gen'ser-ik or jen'-ser-ik.
 Gentile da Fabriano, jen-té'lä da fa-bri-ä'no.
 Gentilly, zhän-ti-ye'.
 Gentz, gents.
 Genzano, jen-tsi'no.
 Geodes, jé'ödz.
 Geodorum, jé-ö-d-or-um.
 Geodynamics, jé-ö-di-näm'-iks.
 Geoffrey, jef'ri.
 Geoffrin, zhof-fran'.
 Geoffroy Saint-Hilaire, zhä-frwä'sän-ti-lär'.
 Geometers (Geometridæ), jé-om-et-erz (jé-om-et'-rid-é).
 Geomorphology, jé-ö-mor-föl'öji.
 Geophilus, jé-ö'il-us.
 Georgievsk, ge-or'gi-evsk.
 Georgswalde, gä-orgz'-val-d'.
 Gephyrea, gef-ir'i-a.
 Gepidae, gä-pi-dä or jep'i-dä.
 Gera, gä'ra.
 Gerace, jä-rä'chä.
 Geraldton, jer'al-ton.
 Geraniaceæ, jer-än-i-ä'se-ä.
 Gerar, g'rär'.
 Gérard, zhä-rär'.
 Gerardmer, zhä-rärd-mär'.
 Gerardy, zhä-rär-dí'.
 Gergeh (Gerga), jir'ji (jir'-ga).
 Gerhard, ger'hart.
 Gerhardt, ger'hart.
 Géricault, zhä-ri-kö'.
 Gering, gä'ring.
 Germander, jer-män'der or jer-män'der.
 Germania, ger-mä'ni-a or jer-män'i-a.
 Germanus, ger-mä'noos or jer-män us.
 Gernersheim, ger'merz-him.
 Gernrode, gern'rö-dä.
 Gernsbach, gernz'bach.
 Gerok, gä'rök.
 Gerolstein, gä-röl-stin.
 Gérome, zhä-röm'.
 Gerona, hä-rö'na.
 Gerontius, gä-ron'ti-oos or jer-on'si-us.
 Gerresheim, ger'res-him.
 Gers, zhär.
 Gersau, ger'sou.
 Gerson, zhär-sön'.
- Gerstäcker, ger'stāk-er.
 Gerstenberg, ger'sten-berg.
 Gerster, gor'ster.
 Geruzez, zhä-rü-zä' or zha'-ru-säs.
 Gervase, jer'väs.
 Gervex, zhär-vä'.
 Gervinus, ger-vi'noos.
 Geryon, ger'rü-ön or ger'i-on.
 Gesenius, ge-sän'i-oos.
 Geshur, g'shoor'.
 Gesner, ges'ner.
 Gesneraceæ, jes-ner-ä'se-é.
 Gessi, jes'si.
 Gessner, ges'ner.
 Gesta Romanorum, ges'tä ro-mä'nö-rom or jes'tä röm-an-ör-um.
 Gestrikland, gä-strik'land.
 Geta, gä'tä.
 Getæ, gä'tä or gété.
 Getafe, hä-tä'fä.
 Gethyllis, geth-il'lis.
 Geulincx, gä'links.
 Geum, jé'um.
 Gevaert, g'värt'.
 Gevelsberg, gä'fels-berg.
 Gex, zhäks.
 Gezer, ge'zer.
 Gfrörer, g'fref'er.
 Ghadames, ghä-dä'mes.
 Gharbieh, ghar-bé'ya.
 Ghardaia, ghar-dä'ya.
 Gharial, g'hur-i-yäl'.
 Ghazel (Ghazal), gha-zal'.
 Ghats (Ghauts), g'häts or gäts (g'hauts).
 Ghazali, gha-zä'lä.
 Ghaziabad, ghä-zä-ä-bäd'.
 Ghazipur, ghä-zé-poor'.
 Ghaznevids, ghäz-nev-idz.
 Ghazni, ghuz'ni.
 Gheel, gäl.
 Gherardesca, ger-ar-des'ka.
 Ghetto, get'to.
 Ghi (Ghee), gä.
 Ghibelline, gib'el-ën.
 Ghiberti, gi-ber'ti.
 Ghika, gä'ka.
 Ghilzal, gil-zä'.
 Ghirlandaio, gër-lan-dä'yo.
 Ghur, ghoor.
 Ghurkas, goor'kaz.
 Gianibelli (Giambelli), jä-ni-bel'li (jam-bel'li).
 Giannone, jan-nö'nä.
 Giaour, jour'.
 Giardini, jä-r-dé'ni.
 Giaring-cho, gyär'ing-chö.
 Giarre, jä'rä.
 Giaveno, ja-vä'nö.
 Gibeah, gib'e-ä.
 Gibeon, gib'e-on.
 Gichtel, gich'tel.
 Gien, zhien.
 Giers, gërz.
 Giesebrecht, gä's'-brecht.
 Gieseler, gä's'l-er.
 Giessen, gä'sen.
 Gifu (Imazumi), gä'foo (i-mä-zoo'mi).
 Gigantes, jig-an'tëz.

Appendix of Pronunciation.

Gijon, hi-hōn'.
 Gila, hē'la.
 Gilan, gē-lān'.
 Gilgal, gil'gal' or gil-gāl'.
 Gilgit, gil-gēt' or gil-git.
 Gilla, jē'lī-a.
 Gillij (Gill), jē'li (jil'li).
 Gill (person), gil.
 Gilliesia, gil-lēs'i-a.
 Gilly, zhē-yē'.
 Gilolo, jil-ō'lo.
 Gilyaks, gil'yaks.
 Gil y Zarate, hil-i-zā'ra-tā.
 Ginatilan, hi-na-ti-lān'.
 Gindoly, gin'de-lū.
 Gingko, ging'kō.
 Ginguené, zhān-g'-nā'.
 Ginnungagap, gin-noong-a-gip.
 Ginsburg, gin'boorg.
 Gioberti, jō-ber'ti.
 Giocondo, jō-kōn'dō.
 Gioja del Colle, jō'ya del kol'la.
 Giojosa Jonica, jō-yō'sa i-n'i-ka.
 Giolitti, jō-lit'ti.
 Giordani, jor-dā'ni.
 Giordano, jor-dā'nō.
 Giorgio, jor'ji-o.
 Giorgione, jor-jō'nā.
 Giottino, jot-tē'nō.
 Giotto di Bondone, jō'tto di bon-dō'nā.
 Giovinazzo, jō-vi-na'tsō.
 Giovio (Jovius), jō'vi-ō (yō'vi-oos).
 Giraldus Cambrensis, jir-al'dus kam-bren'sis.
 Girard, zhē-rār'.
 Girardin, zhē-rar-dān'.
 Girardon, zhē-rar-dōn'.
 Girasol, zhē-rā-zol' or jir'a-sol.
 Girgeh (Girga), jir'ji (jir'ga).
 Girgenti, jir-jen'ti.
 Giralama, gir-yū'ma.
 Girnár, gir-nār'.
 Giron, hi-rōn'.
 Gironde, zhē-rōnd'.
 Girondists, jir'on-distis.
 Girouard, zhē-roo-ār'.
 Gislason, gis-lā-sōn.
 Gisors, zhē-sōr'.
 Gitschin, gich'in.
 Giuliani, joo-li-ā'ni.
 Giuliano in Campania, joo-li-ā'no in kam-pā'ni-a.
 Giulio Romano, joo'li-ō rō-mā'nō.
 Gjurgtu, joor'joo.
 Giusti, joo'sti.
 Givet, zhē-vā'.
 Givors, zhē-vōr'.
 Glazh, gē'zā.
 Gjeljerup, gyel'ler-oop.
 Glabrio, glā'bri-ō.
 Glacis, glā'sis or glā'sē.
 Gladbach, glād'bach.

Glauber, glou'ber.
 Glauchau, glouch'ou.
 Glaucium, glā'si-um.
 Glaucoma, glā-kō'ma.
 Glauconite, glā-kon-it.
 Glaucus, glā'kus.
 Glauz maritima, glāks mar-it'im-a.
 Gleba adscripti, glā'bā ad-skrip'ti or glēb'e ad-skrip'ti.
 Gleichen, glī'chen.
 Gleichenberg, glī'chen-berg.
 Gleichensta, glī-kēn'i-a.
 Gleig, gleg.
 Gleim, glim.
 Gleiwitz, glī'vits.
 Glenalmond, glen-ā'mond.
 Glendalough, glen-dā-loch'.
 Glenelg, glen-elg'.
 Glen Shiel, glen-shēl'.
 Glinka, glin'ka.
 Globigerina, glob-ij-er-in'a.
 Globiocephalus, glōb-i-o-sef'al-us.
 Globulins, glob'ul-inz.
 Globus Hystericus, glōb'us his-ter'ik-us.
 Glochidium, glōk-id'i-um.
 Glockner, glōk-ner.
 Glogau, glō'gou.
 Glommen, glōm'men.
 Glossodia, glōs-ōd'i-a.
 Gloucester, glōs'ter.
 Gluchov, glōo'chov.
 Glucinum, glōo'sin-um.
 Glucosides, glōok'o-sidz.
 Glukhov, glōo'chov.
 Glycas, glū'kas or glē'kas.
 Glycoll, glī'kō-kol.
 Glycogen, glī'ko-jen.
 Glycol, glī'kol.
 Glycosmis, glī-kōs'mis.
 Glycosuria, glī-kōs-ūr'i-a.
 Glycyrrhiza, glī-sir-rī'za.
 Glyphaea, glī-fē'a.
 Glyptodon, glip'tō-don.
 Gmelin, g'mā'lin.
 Gmund, g'mūn'.
 Gmunden, g'mūn'-den.
 Gnaphalium, naf'al'i-um.
 Gneditsch, g'nā'dich.
 Gnelsenau, g'nī'sen-ou.
 Gneiss, nis.
 Gneist, g'nīst.
 Gnome (a sprite), nōm.
 Gnome (an aphorism), nō-mā or nō'mi.
 Gnosticism, nos'ti-sism.
 Gnu, nū.
 Goajira, gō-a-hē'ra.
 Goajira, gō-al-pā'ra.
 Gobelins, gō-b'-lan'.
 Gobi, gō'bi.
 Goch, gōch.
 Godard, gō-dār'.
 Godavari, gō-dā'va-ri.
 Godefroy, gō d'-frwā'.
 Goderich, gōd'rich.
 Godesberg, gō'dez-berg.
 Godet, gō-dā'.
 Godetia, gōd-ēsh'a.
 Godhra, gōd'h'ra.

Göding, ged'ing.
 Gödöllő, ge-del-le'.
 Godoy y Alvarez de Faria, gō doi i al-vi'reth dā fa-rē'a.
 Goedeke, ge'd'-k'.
 Goetje, goo'yā.
 Goeree, goo-rā'.
 Goes (Holland), hoos.
 Goes (Portugal), gō'es.
 Goethe, ge'ta.
 Goethea, gēth'i-a.
 Goetz von Berlichingen, gets fon ber-lich-ing'en.
 Gogol, gō'gūl.
 Goitre, gō'ter or gwā'tr'.
 Gok-Cha, gōk'cha.
 Golconda, gol-kon'da.
 Goldingen, gōld'ing-en.
 Goldschmidt, gōld'shmit.
 Goletta (Goulette), gō-let'-ta (goo-let').
 Gollancz, gōl-lants'.
 Gollnitz, gel'nits.
 Gollnow, gōl'nov.
 Golomynka, gō-lō-min'ka.
 Golovnin, gōl'iv-nēn.
 Goluchowski, gō-loo-kov'-ski.
 Gomar (Gomarus), gō'mār (gō'mā-roos).
 Gomberville, gōn-bār-vēl'.
 Gomez de Avellaneda, gō-meth dā a-vā-lyā-nā'da.
 Gümör, ge-mer'.
 Gomphocarpus, gom-fō-kār'pus.
 Gompholobium, gom-fō-lōb'i-um.
 Gonalves, gō-niv'.
 Gonçalves, gon-sal'vās.
 Goncharov, gōn-char-of'.
 Goncourt, gōn-koor'.
 Gondokoro, gon-dō-kō-ro.
 Gondomar, Diego Sarmiento de Acuña, gon-dō-mār di-ā'go sar-mi-en'to dā a-coo'nyā.
 Gongora y Argote, gon'gō-ra i ar-gō'tā.
 Goniates, gōn'i-at-its.
 Gonocalyx, gōn-ō-kāl'iks.
 Gonsalvo di Cordova, gon-sal'vo di kor-dō-va.
 Gonzales, gon-zā'lāz.
 Goodyera, good-i-ēr'a.
 Göppingen, gep'ping-en.
 Gorakhpur, gō-rach-poor'.
 Gordianus, gor-di-ā'noos or gor-di-ān'us.
 Gorée, gō-rā'.
 Gorgei, ger'gi.
 Gorgias, gor'ji-as.
 Gorgones, gor-gō'nāz.
 Gorgonidae, gor-gon'i-dē.
 Gorinckém, gō'rīnk-em.
 Gorlice, gor-lē'tsā.
 Görlitz, ger'lits.
 Gornegrat, gor-ner-grat'.
 Goroblagodat, gō-rō-blā'hō-dat.
 Götres, ger'res.
 Gortschakov, gōr-cha-kof'.

Gortuna (Gortyn), gor-tū-na (gor-tin').
 Görtz, gerts.
 Götz (Gradisca), gerts (gradis'ka).
 Gossan, gos'an or goz'an.
 Gossypium, gos-sip'i-um.
 Got, gō.
 Göta, ge'ta.
 Götarike, ge-ta-rē'kā.
 Gothenburg (Göteborg), gōth'en-burg (ge'tā-borg).
 Gottfried von Strassburg, got'frēd fon stras'boorg.
 Göttingen, ge'ting-en.
 Gottschall, got'shal.
 Gottsched, got'shed.
 Gottschee, got'chā.
 Gouania, goo-ān'i-a.
 Goudelin, goo-d'-lān'.
 Gough, gōf.
 Goujon, goo-zhōn'.
 Gounod, goo-nō'.
 Gourami, goo-ra-mi.
 Gourko, goor'ko.
 Gouvion St. Cyr, goo-vi-on' sūp-sēr.
 Govenia, gō-vēn'i-a.
 Gowreesankar, gou-rē-shan'kar.
 Goya, gō'ya.
 Goyana, gō-yā'na.
 Goya y Lucientes, gō'ya i loo-thi-en'tās.
 Gozo, gōts'o.
 Gozzi, got'si.
 Gozzoli, got'sō-li.
 Graaf Reinet, grāf rī'net.
 Grabbe, grab'ba.
 Grabow, grā'bov.
 Grabowskia, grab-ou'ski-a.
 Gracchus, grā'kōos or grak'-us.
 Gracedieu, grās-dā'.
 Gracia, grā'thi-a.
 Gracian, grā'thi-an'.
 Gradus ad Parnassum, grā'doos ad par-nās'-soom or grād'us ad par-nās'-um.
 Gräfe, grā'fa.
 Gräfenberg, grāf'en-berg.
 Graffiti, graf-fē'ti.
 Gragnano, gra-nyā'no.
 Grillatores, gral-lat-ōr'ēz.
 Graminaceae, gram-in-ā'-se-ē.
 Grammanthes, gram-man'-thēz.
 Grammatophyllum, gram-mat-ō-fil'um.
 Grammichele, gram-mi-kā'-lā.
 Grammont, grām-mon'.
 Gramont, grā-mon'.
 Granada, gra-nā'da.
 Gran Chaco, gran chā'ko.
 Grande - Combe, grānd-kōm'.
 Grande Chartreuse, grand-shār-trez'.
 Grand Pré, grān-prā'.
 Grandville, grān-vēl'.

Appendix of Pronunciation.

Graniens, gran-ik'us.
 Granja, gran'ha.
 Grannollers, gran-nö-lyärs'.
 Granophyre, gran-o-fir'.
 Gran Sasso d'Italia, gran-sas'so-dit-ä'li-a.
 Grantia, gran'si-a.
 Granville (French), grän-vël'.
 Granville (English), gran-vil'.
 Grao (Villanueva del), grä'o (vi-lyä-noo-ä'va del).
 Graphotype, graf'o-tip.
 Graptolites, grap'to-lits.
 Graptophyllum, grap-to-fil'um.
 Gras, grä.
 Graslitz, gras'lits.
 Grasse, gräs'sa.
 Gratia, grät'ti-ä or grät'-si-ä.
 Gratianus, gra-ti-ä'noos or grät-si-ä'nus.
 Gratry, grät'tri'.
 Graudenz, groud'ents.
 Graulhet, grö-lä'.
 Gravelines, gräv'-lën'.
 Gravelotte, gräv'-lot'.
 Gravenhage, 's, s'grav'en-häg-e.
 Gravesia, grav-ës'i-a.
 Graville St. Honorine, grä-vël' sän-tö-nö-rën'.
 Gravina, gra-vë'na.
 Grävius, grä'vi-oos.
 Grazelema, gra-tha-lä'ma.
 Grazzini, gra-tsë'ni.
 Great Kanawha, kan-g'wa.
 Greenwich, grin'ij.
 Gregale, grä-gü'lä.
 Grégoire, grä-gwä'r'.
 Gregory Thaumaturgus, G. thau-ma-toor'goos or thaum-at-ur'gus.
 Greif, grif.
 Greifswald, grifs'valt.
 Greigia, grä'ja.
 Grein, grin.
 Greisen, griz'en.
 Greiz, grits.
 Grenadines, gren-ad-ënz'.
 Grenelle, gren-el'.
 Grenoble, grä-nö'bl'.
 Gresset, gräs-sä'.
 Grétry, grä'tri'.
 Greuze, grez.
 Grevens Føjde, grä'vens fi'dä.
 Grevillea, gre-vil'i-a.
 Grévy, grä-vi'.
 Grewia, groo'i-a.
 Greywacke, grä-wak'e.
 Griboyedov, gri-bö'ye-dof.
 Grieg, græg.
 Griesbach, gröz'bach.
 Griffon Bruxellois, gri-fon'brü-sel-wä'.
 Grigoresco, gri-gö-rä'sho.
 Grigoriopol, gri-gö-ri-ö'pol.
 Grille, gril.
 Grillparzer, gril'par-tser.

V.

Grimmelshausen, grim-melz-hou'zen.
 Grindelwald, grin'del-valt.
 Gringore, gran-gör'.
 Grigualand, gré'kwa-land.
 Grisebach, grë'sä-bach.
 Griselinia, gri-sel-in'i-a.
 Grisi, grë'si.
 Grisons, gri'zonz or grë-söp'.
 Grivegnée, grë-v'-nyä'.
 Gröber, grë'ber.
 Grocyn, grö'sin.
 Groen van Prinsterer, groon van prin'ster-er.
 Grölier, grö-li-ä'.
 Gronau, grön'ou.
 Groningen, grön'ing-en or hrön'ing-hen.
 Gronovius, grö-nö'vi-oos.
 Groot, gröt.
 Groote Eylandt, grö'te i'lant.
 Gros, grö.
 Grossenhain, grös'sen-hän.
 Grosse-teste, grös-test' or grös-tät'.
 Grosslockner, grös-glok'-ner.
 Gross-Jedlersdorf, grös-yed'lerz-dorf.
 Gross-Lichterfelde, grös-lichter-fel-da.
 Gross-Meseritsch, grös-mäz'er-ich.
 Grossulariaceæ, gros-sul-ä-ri-ä'se-ä.
 Grossularite, gros'sul-ar-it.
 Grosswardein, grös-var'din.
 Grosvenor, gröv'ner.
 Groth, gröt.
 Grottaglie, grö-tä'lyi-ä.
 Grotte, grot'tä.
 Grouchy, groo-shë'.
 Grundtvig, groon'tvig.
 Gruyères, groo-yär'.
 Gryphius, gri'f-oos.
 Gsell-Fels, g'sel'-fels.
 Guacharo, gwa-chä'rö or goo-a-chä'rö.
 Guadagnini, gwa-da-nyë'ni.
 Guadalajára, gwa-da-la-hä'ra.
 Guadalaviar, gwa-da-la-vi-är'.
 Guadalcanal, gwa-dal-ka-nal'.
 Guadalcazar, gwa-dal-ca-thär'.
 Guadalquivir, gwa-dal-ki-vër' or gwad-al-kiw'ir (Eng.).
 Guadalupe (river, Texas), ga-da-loop'.
 Guadalupe Hidalgo, gwa-da-loo pä hi-däl'gö.
 Guadarramas, gwa-dar-rä'-ma.
 Guadeloupe, ga-d'ä-loop'.
 Guadiana, gwa-di-ä'na.
 Guadix, gwa-dëh'.
 Guaduas, gwa'dwas.
 Guaiacum, gwä'ya-cum.
 Guajara, gwa-zhä'ra.

Gualdo Tadino, gwal'do ta-dë'no.
 Gualquay, gwa-lä-gwi'.
 Gualaguaychu, gwa-lä-gwi'choo.
 Guam (Guahan), gwam (gwa-han').
 Guamo, gwä'mo.
 Guan, goo'an.
 Guanabacoa, gwa-na-ba-kö'a.
 Guanacaste, gwa-na-käs'tä.
 Guanaco (Huanaco), gwa-na'kö (hwa-na'kö).
 Guanajay, gwa-na-hi'.
 Guanajuato, gwa-na-hwä'to.
 Guanape, gwa-nä'pä.
 Guanare, gwa-nä'rä.
 Guanches, gwan'chäs.
 Guane (Guanes), gwä'nä (gwä'näz).
 Guanine, gwan'in.
 Guantnamo, gwan-ta-nä'mo.
 Guaporé, gwa-pö'rá.
 Guarayos, gwa-rä'yös.
 Guarda, gwar'da.
 Guardafui, gwar-da-fwë'.
 Guardí, gwär'di.
 Guardiagrele, gwar-di-a-grä'lä.
 Guarini, gwa-rë'ni.
 Guarroman, gwar-rö'man.
 Guastalla, gwas-täl'la.
 Guatemala, gwa-tä-mä'la.
 Guatusos, gwa-too'sös.
 Guaviare, gwa-vi-ä'rä.
 Guayaquil, gwä-a-köl'.
 Guayas, gwä'as.
 Guaycurus, gwä-koo'roos.
 Guaymas, gwä'mas.
 Guayra, gwä'ra.
 Guazuma, gwa-zoo'ma.
 Gudbrandsdal, good-brandz-däl'.
 Guditham, goo-di-at'ham.
 Gudrun, good'troon.
 Guebres, gä'berz.
 Guelderland, gel'der-land or hel'der-lant.
 Guelph, Ghibelline, gwelf, gib'el-lën.
 Guérande, gür-änd'.
 Guérara, gür-ä'ra.
 Guercino, gwer-chë'nö.
 Guéret, gä-rä'.
 Guericke, gä'rik-e.
 Guérin, gä-ran'.
 Guernica, ger-në'ka.
 Guernsey, gern'zi.
 Guerrazzi, gwer-rä'tsi.
 Guerrero, ger-rä'rö.
 Guesclin, gä'klan.
 Guettarda, get-tär'da.
 Gueux, gä.
 Guevara, gä-vä'ra.
 Guglielmi, goo-lyi-el'mi.
 Guiana, gë'ä-na.
 Guibert, gë-bär'.
 Guicciardini, gwi-char-dë-ni.
 Guiccioli, gwi-chi-ö'i'.

Guido d'Arezzo, gwë'do dar-et'so.
 Guido Reni, gwë'do rä'ni.
 Guienne, gë-en'.
 Guignes, gë-ny'.
 Gullielma, gil-i-el'ma.
 Guillemín, gë-y'-man'.
 Guillemots, gil'le-mots.
 Guimarões, gë-ma-rä'anz.
 Guinegate, gën'-gät'.
 Guines, gën.
 Guinevere, gwin'e-vër.
 Guingamp, gan-gän'.
 Guinicelli, gwin-ë-chel'li.
 Guinobatan, gi-nö-ba-tän'.
 Guipuzcoa, gë-pooth'ko-a.
 Guiraud, gë-rö'.
 Guiraut de Borneil, gë-rö'd'-bör'nay'.
 Guisborough, giz'bur'.
 Guiscard, gës-kar'.
 Guise, gëz.
 Guitone, gwit-tö'na.
 Guizot, gë-zö'.
 Gujarat, gooj-rat'.
 Gujranwala, gooj-run-wä'la.
 Gulbarga, gool-bur'ga.
 Gules, gülz.
 Gulpagan, gool-pi-gän'.
 Gumal (Gomul), goo-mul' (gö-mul').
 Gumbinnen, goom-bin'-nen.
 Gummersbach, goom'merz-bach.
 Gümürjina (Gumurzina), gü-mür-jë'na (ge-merzhë'na).
 Gümüş - Khaneh, gü-müş'-kha-nä'.
 Gundella, gun-dël'i-a.
 Gungl, goong'l.
 Günther, gүн'ter.
 Gurdaspur, goor-das-poor'.
 Gurgaon, goor-goun'.
 Gurbal, gur-hwä'l'.
 Gurjun, gur'jun.
 Gustavus Vasa, goos-tä'-voos vä'sa.
 Güstrow, güs'trö.
 Gutenberg, goot'en-berg.
 Gütersloh, güt'er-lö.
 Güts Muths, goots-moots'.
 Gutzkow, goots'kö.
 Gützlaß, güt'släf.
 Guyon, gë-yon'.
 Guyot, gë-yö'.
 Guzman - Blanco, gë'zh'-man-blan'ko.
 Guzmanla, guz-män'i-a.
 Gwadir, gwä'door.
 Gyarus, gü'a-roos or ji'-ar-us.
 Gyergyó - Szent - Miklos, dyer'dye-sent-mi-k'losh'.
 Gyges, gü'ges or ji'jës.
 Gyllippus, gü-lip'pöos or jil-ip'pus.
 Gyllembourg, gyl'len-bour'.
 Gifu (Imazumi), gë'foo (i-mi-zoo'mi).
 Gigantes, jig-an'tëz.

Gyllenstjerna, yäl'len-sheer-na.
Gymnocladus, jim-no-klä'-dus.
Gymnolomia, jim-no-löm'-i-a.
Gymnosophists, jim-nos'-of-ists.
Gymnostachys, jim-no-stäk'is.
Gymnostachyum, jim-no-stäk'i-um.
Gynaecology, jin-ē-kol'ō-ji.
Gynophore, jin'o-för.
Gynura, jin-ür-a.
Gyoma, dyo'mo or jō'mo.
Gyöngyös, dyen-dyesh'.
Györ, dyer.
Gyp, zhip.
Gypsophila, jips-of'il-a.
Gyrostet (Gyroscope), jir'-o-stat (jir'ō-sköp).
Gythium, gū'thi-oom or g'thi-um.
Gyula, dyoo'lo.

Haag, häg.
Haarlemmermeer, här-lem-mer-mär'.
Habeas Corpus, hä'bä-as kor'pōos or häb'i-as kor'pus.
Hachette, ä-shet'.
Hachioji, hä-chē-ō-ji.
Häckel, häk'el.
Häckländer, häk'län-der.
Hadersleben, hä'derz-lä-ben.
Hades, hä'dez.
Hadj (Hajj), häj.
Hadrarnaut, had-ra-mout'.
Hadrianopolis, hä-dri-an-ō-pol-is or häd-ri-an-op'-ol-is.
Hadrianus, hä-dri-ä'noos or häd-ri-än'us.
Hadrosaurus, had-rō-sär'-us.
Häckel, häk'el.
Hæmatemesis, hēm-at-em'-es-is.
Hæmatinuria, hēm-at-in-ür'i-a.
Hæmatocèle, hēm-at'ō-sël.
Hæmatoxylin, hēm-at-oks'-il-in.
Hæmatozoa, hēm-at-ō-zō-a.
Hæmaturia, hēm-at-ür'i-a.
Hæmorrhæa, hēm-od-or-ä's-ä.
Hæmoglobinuria, hēm-ō-glōb-in-ür'i-a.
Hæmophilia, hēm-ō-fil'i-a.
Hæmoptysis, hēm-op'tis-is.
Hæmus, hä'moos or hēm'us.
Hegar, hä'gär or häg'ar.
Hagedorn, hä'ge-dorn.
Hägelberg, häg'el-berg.
Hagen, häg'en.
Hagenau, häg'en-ou.
Hagenbach, häg'en-bach.
Hagi, hi'gi.
Hagiography, hag-i-og'raf-i.

V.

Hagiology, hag-i-ol'ō-ji.
Hagonoy, hä-gō-noi'.
Hague (Dutch), häg.
Hague (French), häg.
Hahnemann, hä'ne-man.
Haicheng, hi-cheng'.
Haidarabad, hi-dur-ä-bäd'.
Haiduks, hi-duks'.
Haiduong, hi-doo-ong'.
Haifa, hi'fa.
Haimura, hi-moor'a.
Hainan, hi-nan'.
Hainan, hi'nou.
Hainault, ä-nō'.
Hainburg, hin'boorg.
Hainichen, hi'nich-en.
Haiphong, hi-fong'.
Haiti, hä'ti or hä-ē-tē' (Fr.).
Hai-yun-tau, hi-yoon-tou'.
Hajduken, hä-duk-en.
Hajdunanas, hi-doon-ön-ōsh'.
Hajduszoboszlo, hi-doo-ō-bōs'lo.
Hajipur, hä-ji-poor'.
Hakim ibn Allah, hä-kēm'-ibn-ä-lä'.
Hakluyt, häk'lit.
Hakodate, hä-ko-dä'tä.
Hakone, hä-kō-nä.
Hakas, hä-lōsh'.
Halberstadt, häl'ber-stat.
Halévy, ä-lä-vi'.
Halfaya, hä-lä-yä.
Halicz, hä'lich.
Halle, hä'lä.
Hallé, hä'lä.
Hällefinta, hä-l-le-flin'ta.
Hallein, hä'l'in.
Halysites, hä-l-i-sit'ez.
Hamadryad, hä-m-ad-ri'ad.
Hamasa, hä-ma-sä'.
Hambach, häm'bach.
Hambato, häm-bä'tō.
Hamerling, häm'er-ling.
Hammarasköld, häm'mar-sheld.
Hamme, häm'm'.
Hammerich, häm'm'-rich.
Hammer-Purgstall, häm'mer-poorg'stäl.
Hanau, hän'ou.
Hang-chou-fu, hang-chou-foō'.
Hangō, hang'ō.
Hankow, hän-kou'.
Hanoi, hä-noi'.
Hanoteaux, hä-nō-tō'.
Hansteen, hän'stän.
Hanswurst, hänz'voorst.
Hanthawadi, hän-tha-wä'-di.
Hanuman, hä-noo-män'.
Han-yang-fu, hän-yang-foō'.
Haparanda, hä-pa-ran'da.
Hapsburg, häps'boorg.
Harafuras, hä-ra-foō'ras.
Hara-Kiri, hä-ra-kē'ri.
Hardanger Fjord, härdang-er fyörd.
Harderwijk, här'der-wik.
Hardouin, hä-r-doo-an'.

Hardwar, hurd-wär'.
Häring, här'ing.
Hariri, hä-rē'ri.
Harfleur, hä-r'fler'.
Harlamov, hä-räm'of.
Haro, ä-ro.
Haromszek, hä-röm-sek'.
Haroun - al - Raschid, hä-roon'-al-ra-shēd'.
Harpignies, är-pē-nyē'.
Harpocrates, hä-r-pō'kra-täz.
Harpyia, hä'r-pwi-ä or hä'r-pi-ē.
Harrisse, hä-rēs'.
Hartmann von Aue, härt-män fon ou'a.
Hartzenbusch, härts'en-boosh.
Haruspices, hä-roos'pi-käz or hä-r-us'pi-sēz.
Harwich, hä'r'ij.
Harzburg, härts'boorg.
Hasdeu, häs'dyoo.
Hasdrubal, häs'droo-bal.
Hase, häz'.
Hashish, häsh-ēsh'.
Hasmonæans, häz-mon-ē'-anz.
Haspe, häs'p'.
Hassan-ben-Sabah, häs'-san-ben-sa-bä'.
Hasse, häs'.
Hathras, hät'h'rus.
Hatia, hät'ä.
Hatten, hä-tē-an'.
Hatim et-T'ai, hä'tim-et-t'ä-ē.
Ha-tinh, hä-tan'y'.
Hatou, hä-too'.
Hatvan, hot-von'.
Hatzfeld, häts'felt.
Haubourdin, hö-boor-dan'.
Hauch, houch.
Hauff, houf.
Haugesurd, hou'gä-soond.
Haulbowlie, hä-l-bō'lin.
Hauptmann, haupt'man.
Hauran, hou-rän'.
Hauréau, hö-rä-ō'.
Hausa, hou'sa.
Hautbois, hö'boi.
Haute-Garonne, öt-gä-ron'.
Haute-Loire, öt-lwär'.
Haute-Marne, öt-mär'n'.
Haute-Saône, öt-sōn'.
Haute-Savoie, öt-sä-vvü'.
Haute-Vienne, öt-vē-en'.
Haute-Alpes, öt-alp'.
Haute-Pyrénées, öt-pē-rä-nä'.
Haumont, öt-mon'.
Haut-Rhin, öt-rap'.
Häuy, ä-ü-ē'.
Häuyne, hä'ün.
Havas, ä-vä'.
Havre (Le Havre), ä'vr' (l'-äv'r').
Hawaii, hä-wi'ä.
Hawarden, hä'r'den.
Hayashi, hä-yä'shē.
Haynau, hi'nou.
Hayti, hi'tä.

Hazaribagh, hä-zä-rē-bäg'.
Hazebrück, häz-brück'.
Hebdomadäl, heb-dom'ad-al.
Hebe, hä'bä or hē'bē.
Hébert, ä-bär'.
Hecataeus, he-ka-tä'oos or hek-at-ē-us.
Hecate, hek'at-ē.
Heckmondwike, hek'mond-wik.
Hecuba, he'koo-ba or hek'-üb-a.
Hedin, hē'din.
Hedonism, hēd'on-izm.
Heem, häm.
Heemskerk, hämz'kerk.
Heeren, hä'r'en.
Hefe, hä'fä-lä.
Hegel, hä'gel.
Hegesippus, hä-gä-sip'oos or heg-es-ip'us.
Heiberg, hi'berg.
Heide, hi'd'.
Heidegger, hīd-eg'er.
Heidelberg, hīd-el-berg.
Heidenheim, hīd'en-him.
Heidenstam, hīd'en-stam.
Heijn, hīn.
Heilbron, hīl-bron.
Heil Dir im Siegerkranz, hīl-dēr'-im-zēg'er-krantz.
Heiligenstadt, hīl'ig-en-stat.
Heilsberg, hīlz'berg.
Heilbronn, hīlz'bron.
Heine, hīn'a.
Heineccius, hīn-ets'i-oos.
Heinicke, hīn'ik-ä.
Heinrich von Meissen, hīn'rich fon mīs'en.
Heinsius, hān'si-oos.
Heister, hīs'ter.
Hejaz, hej'az.
Hejira (Hijra), hej-ir'a (hij'ra).
Helgoland, hel'gō-land.
Heliade-Radulescu, hel'ya-dä-ra-doo-lä-shoo.
Holland, hä'l'and.
Helicidæ, hel-is'id-ē.
Heliogravure, hel'i-ō-grav-ür.
Heliometer, hēl-i-om'et-er.
Heliozoa, hel-i-ō-zō-a.
Hellebor, hel'leb-ör.
Hollin, e-lyen'.
Helminthology, hel-min-thol'ō-ji.
Helmond, hel'mont or hel-mon' (Fr.).
Helmont, hel-mon'.
Helmstedt, helm'stet.
Helotes, hä-lō'täz or hel-öt'ez.
Helpmakaar, help-ma-kär'.
Helsingfors, hel'sing-förz.
Helsingör, hel'sing-er.
Helvellyn, hel-vel'in.
Helvetii, hel-vä'ti-i or hel-vē'shi-i.
Helvétius, hel-vä-ti-oos'.
Helwan, hel-wi'ä.

Appendix of Pronunciation.

Hemsterhuis, hem'ster-hois.	Hernani, er-nä'ni.	Hijar, i-har'.	Hohenlohe-Schillings-fürst, hō'en-lō-ā-shil'-lings-fürst.
Hengstenberg, heng'sten-berg.	Hernici, her'ni-ki or her'-ni-si.	Hikone, hi-kō'nā.	Hohenmauth, hō'en-mout.
Hénin-Liétard, hā-nan'-li-ā-tär'.	Hernösand, her'ne-sant.	Hildburghausen, hilt'-boorg-hou-zen.	Hohenschwangau, hō'en-shvang-ou.
Henle, hen'l'.	Herodes Atticus, her-ō'dāz at'ti-koos or her-ōd'ēz at'tik-us.	Hildebrand, hilt'brant.	Hohenstaufen, hō'en-stouf-en.
Hennebont, hen-n'-'bōn'.	Hérold, hā-rōl'.	Hildegard, hilt'e-gart.	Hohenstein-Ernstthal, hō'-en-stin-ernst'täl.
Hennegau (Hennegou w-en), hen'neg-ou (hen'-neg-ou-en).	Herophilus, her-of'il-us.	Hildesheim, hilt'des-him.	Hohenzollern, hō'en-tsol-lern.
Henner, en-när'.	Herostatus, her-os'tra-tus.	Hilo, hē'lō.	Hohkönigsburg, hō-ken'igs-boorg.
Henschel, hen'shel.	Herrera, er-rā'ra.	Hilversum, hilt'ver-sum.	Höhscheid, hē'shit.
Henselt, hen'zelt.	Herrhut, hern'hoot.	Himalaya, hi-mā'la-ya or him-al-ā'ya (wrong).	Hoi-how, hoi-hou'.
Hephestion, hef-ās'ti-ōn or hef-ēs'ti-on.	Hertford, har'ford.	Himyaritic, him-yar-it'ik.	Hoiyer, hoi'yer.
Hephestus, hef-ās'toos or hef-ēs'tus.	Hertogenbosch, her-tō'gen-bosh.	Himysars, him'yarz.	Hokitika, hō-ki-tē'ka.
Heppenheim, hep'pen-him.	Hervé, hār-vā'.	Hinayāna, hē-na-yā'na.	Hokkaido, hō-ki'dō.
Heracleia, her-ak-lā'a or her-ak-lī'a.	Hervieu, hār-vy'ē.	Hincmar, hink'mar.	Holbein, hōl'bīn.
Heraclian, her-ak'li-an.	Herward von Bittenfeld, her'vart fon bit'ten-felt.	Hindö, hind'ē.	Holguin, ol-gēn'.
Heraclicæ, her-ak'li-dā or her-ak'lid-ē.	Herwegh, her-väch'.	Hindu Kush, hin'doo-koosh.	Hollandsch Diep, hol'-lantsk-dēp.
Heracilitus, her-ak'li-toos or her-ak'lit-us.	Herz, herts.	Hinojosa del Duque, i-no-hō'sa del doo'kā.	Holmfirth, hōm'ferth.
Heræum, hā-rā'oom or her-ē'um.	Herzogovina, her-tse-gō-vē'na.	Hippocampus, hip-pō'kam-poos or hip-po-kam'pus.	Holothurians, hol-ō-thoor'-i-us.
Hérault, ā-rō'.	Herzen, herts'en.	Hippocrates, hip-pō'kra-tāz.	Holtei, hōl'ti.
Herbarium, her-bār'i-um.	Herzl, herts'l.	Hippolyte, hip-pō'lit-ā.	Holtzendorf, hōl'tsen-dorf.
Herculano de Carvalho e Avariço, er-koo-lā'nō dā car-vā'lyō ā a-va-rē'zho.	Herzog, her'tsōg.	Hippolytus, hip-pō'lit-oos.	Holzminden, hōlts'min-den.
Hercynian, her-sēn'yan.	Hesiodus, hēs'i-ō-dooos.	Hippopotamus, hip-pō'pot'-am-us.	Homburg vor der Höhe, hom'boorg för dār hē'ā.
Herero, her-ār'ō.	Hesione, hes-i-ō'nā.	Hippuritids, hip-pūr-it'idz.	Homocercal, hōm-ō-ser'kal.
Herford, her'ford.	Hesperides, hes-per'id-ēz.	Hipurinas, hip-oor'in-as.	Homocousian, Homolousian, hō-mō-ous'i-an, hō-moi-ous'i-an.
Hergenröther, her-gen-ret'-er.	Hesperornis, hes-per-or'nis.	Hirado, hē-rā'dō.	Homotaxial, hōm-ō-taks'-i-al.
Heringsdorf, hār'ings-dorf.	Hesse-Cassel, hess-kas'sel.	Hiranyagarbha, hē-ran-ya-gār'b'ha.	Ho-nan-fu, hō-nan-foo'.
Héri-Rud (Hari-Rud), hā-ri-rood' (hā-ri-rood').	Hesse - Darmstadt, hess-darm'stat.	Hirosaki, hē-rō-sā'ki.	Honda, ōn'da.
Herisau, hār'is-ou.	Hesse - Nassau, hess-nas'-sou.	Hiroshima, hē-rō-shē'ma.	Honfleur, ōn-fleur'.
Herkomer, her'kōm-er.	Hesychasts, hā'si-kasts.	Hirson, ir-son'.	Hongai, hong-ī'.
Herkulesbad, her-koo-les-bād'.	Hesychius, hā-sē'ki-oos.	Hirtius, hir'ti-oos or her'-shi-us.	Honolulu, hō-nō-loo'loo.
Hermæ, her'mā or her'mē.	Hetaïrai, he-tā'rā or het-ir'i.	Histæus, his-ti-ē-us.	Honthelm, hōnt'him.
Hermándad, er-man-dād'.	Heterocercal, het-er-ō-ser'-kal.	Hitopadesa, hi-tō-pa-dā'-sha.	Hoof, höft.
Hermannstadt, her'man-stat.	Hettstedt, het'stet.	Hitzig, hit'sig.	Hoogeveen, hō'ge-vān.
Hermoneutics, her-men-ū'tiks.	Heuglin, hoi'glin.	Hjelmar, hyel'mar.	Hoorn, hörn.
Hermione, her-mi-ō'nā.	Heves, hā'vesh.	Hjörning, hyer'ning.	Horatili, hō-rā'ti-i or hōr-ā'shi-i.
Hermocrates, her-mō'kra-tāz or her-mok'rat-ēz.	Hexateuch, heks'at-ūk.	Hkamti Long, k'ham'ti long.	Horatius Cocles, hōr-ā'shi-us kok'lēz.
Hermogenes, her-mō'gen-āz or her-moj'en-ēz.	Heyne, hi'na.	Hoatzin, hō'at-zin.	Hörde, her'd'.
Hermonthis, her-mon'tis.	Heyse, hi'za.	Hoche, ōsh.	Hormayr, hör'mir.
Hermopolis Magna, her-mō'pol-is mā'nya or her-mop'ōl-is mag'na.	Hibiscus, hib-is'kus.	Hochelaga, hok-ā-lā'ga.	Hordenka, hō-rō-den'ka.
Hermosillo, her-mō-sē'lyō.	Hidalgo, i-dal'gō.	Hochheim, hōch'him.	Horowitz, hor'c-vits.
Hermupolis, her-mi'pol-is.	Hiel, hēl.	Hochkirch, hōch'kirch.	Horsens, hor'sens.
	Hiempal, hi-emp'sal.	Höchst, hechst.	Horta, or'ta.
	Hieracium, hi-er-ās'i-um.	Höchstädt, hech'stet.	Hortense, ör-täns'.
	Hierapolis, hi-er-ap'ōl-is.	Hodeida, hō-dā'da.	Hortensius, hor-ten'si-us.
	Hierarchy, hi'er-ar-ki.	Hód-Mező-Vásárhely, hōd-mā'ze-vā'shār-hā-ly'.	Horvát-Szlavonország, hor-vāt'-slo-vō-nōrsg'ag.
	Hidres, hi-ār'.	Hoenir, hen'ēr.	Horvath, hor-vāt'.
	Hieron (Hiero), hē'er-ōn or hi'er-ōn (hē'er-ō or hi'er-ō).	Hoeven, hoov'en.	Horwich, hor'ij.
	Hieronymites, hē'er-on'im-its.	Hofmeister, hof'mi-ster.	
	Hierro, i-er'ró.	Hofmeyr, hof'mir.	
		Hogmanay, hog'man-ā.	
		Hohenelbe, hō'en-el-b'.	
		Hohenheim, hō'en-him.	

END OF VOL. V.